PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-025035
(43)Date of publication of application : 25.01.2002

(51)Int.Cl. G11B 5/702
C09D127/06
C09D129/04
C09D131/04
C09D157/00
C09D175/04

(21)Application number : 2000-211876
(22)Date of filing : 12.07.2000

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(54) MAGNETIC RECORDING MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a magnetic recording medium having high dispersibility in a magnetic layer and such durability that the medium can be used even under special service conditions.
SOLUTION: The magnetic layer 2 contains, as a binder, copolymer obtained by polymerizing a polyurethane resin having ≥3 mmol/g concentration of urethane groups and obtained by polymerizing a glycol and an aromatic diisocyanate and a compound having a vinyl group. The glass transition temperature of the magnetic layer 2 is ≥ 100°C.

LEGAL STATUS
[Date of request for examination]
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than

the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Nonmagnetic base material The magnetic layer applied and formed [**** / content] in magnetic powder and a binder It is the magnetic-recording medium equipped with the above, and a glycol and aromatic system diisocyanate carry out the polymerization of the above-mentioned magnetic layer as a binder, and it contains the polyurethane resin whose urethane machine concentration is 3 or more mmol/g, and the copolymer the compound which has a vinyl group comes to carry out a polymerization, and the glass transition temperature of the above-mentioned magnetic layer is characterized by being 100 degrees C or more.
[Claim 2] The magnetic-recording medium according to claim 1 characterized by having the interlayer of at least one or more layers between the above-mentioned nonmagnetic base material and the above-mentioned magnetic layer.
[Claim 3] The above-mentioned polyurethane resin is a magnetic-recording medium according to claim 1 characterized by having at least one or more kinds in the third class amine, quarternary ammonium salt, a sulfonic-acid alkali-metal salt, or a carboxylic acid as a polar group.
[Claim 4] It is the magnetic-recording medium according to claim 1 which the above-mentioned polyurethane resin has the third class amine as a polar group, and is characterized by the above-mentioned copolymer being a vinyl chloride system copolymer which has an epoxy group as a polar group.
[Claim 5] The glass transition temperature of the above-mentioned polyurethane resin is a magnetic-recording medium according to claim 1 characterized by being the range of 100 degrees C or more and 180 degrees C or less.
[Claim 6] The compound which has the above-mentioned vinyl group is a magnetic-recording medium according to claim 1 characterized by being at least one or more kinds in a vinyl chloride, vinyl alcohol, and vinyl acetate.
[Claim 7] The polymerization degree of the above-mentioned copolymer is a magnetic-recording medium according to claim 1 characterized by being 100 or more and 400 or less range.
[Claim 8] The molecular weight of the above-mentioned glycol is a magnetic-recording medium according to claim 1 characterized by being 62 or more and 250 or less range.
[Claim 9] The above-mentioned magnetic layer is a magnetic-recording medium according to claim 1 characterized by containing an isocyanate compound as a curing agent.
[Claim 10] The surface roughness Ra of the above-mentioned magnetic layer is a magnetic-recording medium according to claim 1 characterized by being the range of 3nm or more and 7nm or less.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention is equipped with the magnetic layer and nonmagnetic base material containing magnetic powder and a binder, and relates to the magnetic-recording medium used as videotape, an audio tape, a flexible disk, a data storage tape for computers, etc.
[0002]
[Description of the Prior Art] In recent years, magnetic recorder and reproducing devices, such as Hi-Vision VTR and digital VTR, are high-performance-ized increasingly, and the information processing capacity is improving by leaps and bounds. In connection with this, high-density record-ization is advancing aiming at high-density mass realization by the magnetic-recording medium on which magnetic information is recorded by these magnetic recorder and reproducing devices.
[0003] It is important to smooth a medium front face more, while using a metal particle as magnetic powder, in order to realize high-density record-ization of an applied type magnetic-recording medium, to suppress a spacing loss to the minimum, and to reduce the output loss by record demagnetization. Equalization of the coercive force of magnetic powder, the increase of saturation magnetization, and the coercive force distribution of magnetic powder as technique which attain these purposes, grant of a perpendicular anisotropy, thin film-ization of a magnetic layer, etc. are mentioned.
[0004] Among these, improvement of magnetic powder is the technique of raising an output directly. About the improvement about such coercive force and saturation magnetization, examination of the elementary composition of magnetic powder etc. is performed and the metal particle to which coercive force exceeds 160 kA/m, and the metal particle to which saturation magnetization exceeds 140Am(s) 3/kg are also developed further. Moreover, although a grain-size distribution of magnetic powder is reflected in a coercive force distribution, the coercive force distribution is also remarkably improved by equalizing this grain size.
[0005] Grant of a perpendicular anisotropy is the technique for the densification by the vertical magnetic recording. The place which is depended on control of the magnetic orientation of magnetic powder about this in the case of an applied type magnetic-recording medium is large. For example, when using a needlelike particle, to perform perpendicular orientation processing or method orientation processing of slanting to a paint film is tried. However, by the time it becomes practical [these orientation processings] from problems on the front face of a paint film by the difficulty of orientation control, and orientation, such as disorder, it will not have resulted.
[0006] Thin film-ization of a magnetic layer is considered to be very effective as a method of reducing a self-demagnetization loss. Here, if thickness of a magnetic layer is simply thin-film-ized to 1 micrometer or less, the shape of surface type of a nonmagnetic base material will become easy to appear in a magnetic layer front face, and smoothing on the front face of a magnetic layer will become difficult. For this reason, in thin-film-izing a magnetic layer, the case where the multistory application type composition between which a non-magnetic layer is made to be placed between a nonmagnetic base

material and a magnetic layer is taken has increased. Thus, thickness is earned between a nonmagnetic support surface and a magnetic layer front face by making a non-magnetic layer intervene, and the shape of surface type of a nonmagnetic base material stops being able to appear in a magnetic layer front face easily. Therefore, it will be formed by the shape of surface type with a smooth magnetic layer with thin thickness.

[0007] Various improvement is proposed about the this multistory application type magnetic-recording medium. For example, the method (JP,63-187418,A) of setting application thickness of a non-magnetic layer to 0.5 micrometers - 3.5 micrometers, How (JP,4-238111,A) to make a non-magnetic layer contain a suitable quantity of carbon black, How to cover the front face of the nonmagnetic oxide of a non-magnetic layer with an inorganic substance (JP,5-182177,A), The method using two or more kinds of nonmagnetic powder with which sizes differ in a non-magnetic layer (JP,5-274651,A), The method (JP,5-298653,A) of regulating the standard deviation of the thickness of a magnetic layer within the limits of specification, the method (JP,6-162485,A, JP,6-162489,A) of constituting a magnetic layer from a magnetic layer more than two-layer, etc. are reported.

[0008] Moreover, examination is made also about the formation method of a non-magnetic layer and a magnetic layer, and the simultaneous multistory application method (sentiment-on wet application method) by which a nonmagnetic paint and a magnetic paint apply a nonmagnetic paint and a magnetic paint simultaneously on a nonmagnetic base material by this die head using the die head which has two slits extruded, respectively is proposed. By this simultaneous multistory application method, the paint film of uniform thickness with few application defects and coating sources can be formed. therefore, electromagnetism -- it excels in the transfer characteristic and a medium with few noises is obtained Moreover, the non-magnetic layer and magnetic layer which were formed have high adhesion, and the outstanding endurance is acquired.

[0009] In this simultaneous multistory application method, adjustment of each paint property is important. From such a viewpoint, as a solvent used for paint-ization of a magnetic paint and a nonmagnetic paint The method (JP,63-31028,A) using the poor solvent to a binder, How to make in agreement the solubility parameter of a magnetic paint and a nonmagnetic paint (JP,3-119518,A), How to make in agreement the Reynolds number of a magnetic paint and a nonmagnetic paint (JP,4-271016,A), The same in a magnetic paint and nonmagnetic paints, or the method of giving the approximated thixotropy nature (JP,4-325917,A), How (JP,5-128496,A) to make the flow curve of a paint fitting [formula / specific], The method (JP,5-208165,A) of specifying an enlargement flow index, the method (JP,6-195690,A) of specifying the creep deformation of a paint, the method (JP,5-266463,A) of making a constant rate the ratio of the maximal value and the minimal value of the loss elastic term of a paint, etc. are proposed.

[0010] Moreover, since a medium front face is formed very flat and smooth, when a multistory application type magnetic-recording medium makes it run a record regenerative-apparatus top, the touch area to various slide member becomes large, and coefficient of friction to these slide member becomes a big value. For this reason, it is difficult to acquire run endurance. And in a magnetic tape, the tape length which can hold in a cassette is long-picture-ized, it is the purpose which increases the storage capacity per cassette, and medium overall thickness tends to make it thin in recent years. For this reason, it is still more difficult to acquire endurance.

[0011] And by short-wavelength-izing record wavelength which records magnetic information with thin-film-izing of a magnetic layer which was mentioned above, and double stratification of a paint film, and atomizing the magnetic powder contained in a magnetic layer aims at high-density mass realization because magnetic powder forms the magnetic layer which comes to carry out high-density restoration.

[0012] However, a surface area increases, so that it atomizes, since the surface area and cohesive force are proportional, and magnetic powder is equipped with strong cohesive force. That is, it is easy to condense the magnetic powder which it atomized in a magnetic layer. For this reason, magnetic powder distributed highly, and high-density restoration was carried out and it was difficult to form the magnetic layer which is carrying out high orientation.

[0013] Then, the development and examination of dispersibility of a high resin which can enough be

distributed are briskly performed as a binder contained in a magnetic layer in the magnetic powder which it atomized. generally as a binder which a magnetic layer is made to contain, resins, such as a vinyl chloride system copolymer, a polyurethane resin, a cellulose system resin (JP,7-176035,A), a FENIKISHI resin, and polyacetal resin (JP,7-192251,A), are independent -- or it is mixed and is used Also in these resins, since introduction of various functional groups is possible for it while especially a polyurethane resin has wide range physical properties, various examination is made.
[0014] JP,7-235044,A -- electromagnetism -- using as a binder the polyurethane resin which introduced the third class amine as a polar group for the purpose of improvement in the transfer characteristic is indicated Moreover, by JP,3-190983,A and JP,3-203811,A, using as a binder the polyurethane resin of the specific composition which introduced the alkylphosphine machine is indicated again in order to improve the dispersibility in hypoviscosity and a high solid content. Furthermore, in JP,7-50010,A, using the urethane urea using the specific amine as a binder for the purpose which improves magnetic layer dispersibility is indicated.
[0015] By the way, such a magnetic-recording medium is used under the service condition which continues variably, and is asked for improvement in the further endurance. As a service condition which continues variably, the service condition which repeats one magnetic-recording medium and carries out record reproduction is mentioned, for example. Moreover, specifically, the special service condition of carrying out record reproduction only of the intact magnetic-recording medium continuously, the case where video software is dubbed in large quantities, the case where use the videotape the object for coverage and for edit properly at a broadcasting station etc., and record reproduction of the intact videotape is always continuously carried out with a camcorder etc., etc. are mentioned.
[0016] When it is made to run an intact magnetic-recording medium, as compared with the case where it is made to run the magnetic-recording medium by which repeat use was carried out, it is easy to deposit the affix on the front face of a medium etc. on a head etc. at the slide member in a magnetic recorder and reproducing device, and a concrete target. When a magnetic-recording medium is produced with a blemish in a magnetic layer with the sediment deposited on the head etc., magnetic properties will deteriorate. For this reason, the magnetic-recording medium used on a special service condition is asked for the very high endurance of the magnetic layer by such sediment which can bear for getting damaged.

[0017]
[Problem(s) to be Solved by the Invention] However, thixotropy became high and the magnetic paint only containing a polyurethane resin which was mentioned above as a binder had the inclination for coating nature to get worse. Moreover, although the magnetic layer which comes to apply this magnetic paint is excellent in intensity, it is lacking in an adhesive property. For this reason, the magnetic-recording medium equipped with the magnetic layer only containing a polyurethane resin which was mentioned above as a binder had the problem that it did not have usable endurance even if it is a special service condition.
[0018] It is making a magnetic layer contain the abrasive material which grinds the magnetic head as the technique of raising the endurance of a magnetic-recording medium generally, adjusting a kind or a particle diameter of an abrasive material etc., and preventing the blinding of the magnetic head, and preventing with [of the magnetic layer by the sediment got blocked in the head] a blemish is performed.
[0019] however, a possibility that the surface roughness of a magnetic layer may deteriorate if an abrasive material is added so much to the magnetic layer containing a polyurethane resin which was mentioned above as a binder -- it is -- as a magnetic-recording medium -- electromagnetism -- the transfer characteristic may have fallen Moreover, when the abrasive material was added so much to the magnetic layer, the magnetic head was ground violently and there was a possibility that the use life might become short. For this reason, it was not based on the kind or addition of an abrasive material particle to add, but improving the endurance of a magnetic-recording medium was called for.
[0020] this invention is proposed in view of such the conventional actual condition -- having -- the bottom of a service condition high [the dispersibility of a magnetic layer], and special -- also setting --

usable endurance -- having -- the optimal electromagnetism for high-density record -- it aims at offering a magnetic-recording medium equipped with the transfer characteristic

[0021]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the magnetic-recording medium concerning this invention In a magnetic-recording medium equipped with a nonmagnetic base material and the magnetic layer which applies the magnetic paint containing magnetic powder and a binder, and is formed a magnetic layer The polyurethane resin whose urethane machine concentration a glycol and aromatic system diisocyanate carry out a polymerization as a binder, and is 3 or more mmol/g, The copolymer the compound which has a vinyl group comes to carry out a polymerization is contained, and the glass transition temperature of a magnetic layer is characterized by being 100 degrees C or more.

[0022] Since the magnetic-recording medium concerning this invention constituted as mentioned above contains the above-mentioned polyurethane resin and it has the magnetic layer whose glass transition temperature is 100 degrees C or more, the dispersibility of a magnetic layer is high and the intensity of a magnetic layer is secured. Moreover, since the above-mentioned polyurethane resin and the compound which has a vinyl group contain combining the copolymer which comes to carry out a polymerization as a binder, this magnetic-recording medium has the good coating nature of a magnetic layer, and it is excellent in surface smooth nature.

[0023]

[Embodiments of the Invention] Hereafter, the alkaline cell concerning this invention is explained in detail, referring to a drawing. The monolayer application type magnetic-recording medium which applied this invention is equipped with a magnetic layer 1 and the nonmagnetic base material 2 as shown in drawing 1 .

[0024] A magnetic layer 1 applies the magnetic paint containing magnetic powder and a binder on the nonmagnetic base material 2, and is formed, and a polyurethane resin and the copolymer the compound which has a vinyl group comes to carry out a polymerization are contained at least as a binder.

[0025] The glass transition temperature of this magnetic layer 1 is 100 degrees C or more. The glass transition temperature of a magnetic layer 1 is dependent on the glass transition temperature of the various binders which constitute a magnetic layer 1, and is determined by mixed ratios, such as a polyurethane resin specifically mentioned above and a compound which has a vinyl group. When the glass transition temperature of a magnetic layer 1 is less than 100 degrees C, the magnetic-recording medium has the inadequate intensity of a magnetic layer 1, and is not equipped with desired endurance.

[0026] Moreover, although especially the upper limit of the glass transition temperature of a magnetic layer 1 is not limited, when it is the magnetic-recording medium used for the magnetic recorder and reproducing device of the helical scan used for VTR etc., it is desirable [a glass transition temperature] that it is the range of 100 degrees C or more and 180 degrees C or less. when the glass transition temperature of a magnetic layer 1 is the above-mentioned range, though a magnetic-recording medium is used for the magnetic recorder and reproducing device of a helical scan, its contact nature is good, and a spacing loss prevents it -- having -- electromagnetism -- it excels in the transfer characteristic

[0027] The polyurethane resin contained as a binder carries out the polymerization of a glycol and the aromatic system diisocyanate to a magnetic layer 1. And the urethane machine concentration of this polyurethane resin is 3 or more mmol/g. Here, urethane machine concentration expresses the number of the urethane bond per 1g of polyurethane resins.

[0028] When the polyurethane resin whose urethane machine concentration is less than 3 mmol/g contains in a magnetic layer 1 as a binder, the glass transition temperature of a magnetic layer becomes less than 100 degrees C, and desired endurance is not attained as a magnetic-recording medium.

[0029] In order to make urethane machine concentration into 3 or more mmol/g, it is desirable to use a low-molecular glycol and it is desirable to specifically use the glycol whose molecular weight is 62 or more and 250 or less. Although especially the upper limit of urethane machine concentration is not limited, the upper limit of the urethane machine concentration of the polyurethane resin to which the polymerization of the glycol whose molecular weight is 62 or more and 250 or less was carried out is

8.5 mmol/g on the theory. moreover, the purpose which prevents the fall of the dispersibility accompanying viscosity elevation of a magnetic paint -- three-dimensional -- ** -- when combining the glycol which has a high glycol or a high side chain, the molecular weight of the glycol is 130 or more and 230 or less range, and the urethane machine concentration of the polyurethane resin to which the polymerization of this glycol was carried out serves as the range of 3.0 or more mmol/g and 6.5 mmol/g on the theory

[0030] As a glycol whose molecular weight is 62 or more and 250 or less For example, the low-molecular polyol used as the raw material of a polycarbonate, i.e., ethylene glycol, 1, 3-propylene glycol (PG is called hereafter.) 1, 2-PG, 1, 4-butanediol, 1, 5-pentane glycol, 1, 6-hexandiol, the 3-methyl -1, 5-pentane glycol, neopentyl glycol (it is hereafter called NPG for short.) 3 and 3-dimethanol heptane (it is hereafter called DMH for short.) 1, 8-octane glycol, 1, 9-nonane diol, a diethylene glycol, A cyclohexane -1, 4-diol, a cyclohexane -1, 4-dimethanol, An ethyleneoxide or a propylene oxide addition product of a dimer-acid diol, a trimethylol propane, a glycerol, hexane triol, a KUODO roll, or bisphenol A etc. is mentioned.

[0031] moreover -- as a glycol -- three-dimensional -- bulk -- it is desirable to use what has high structure, and the thing in which the carbon number of a side chain has long structure three-dimensional -- bulk -- the polyurethane resin using the high glycol, the glycol which has a side chain, and the glycol component which specifically has the benzene ring and a cyclic structure as a frame is excellent in the solubility over various organic solvents, even if urethane machine concentration and a glass transition temperature are high Therefore, the magnetic layer 1 which contains this polyurethane resin as a binder is equipped with high dispersibility.

[0032] three-dimensional -- bulk -- as a glycol which is the high molecular structure, cyclohexane dimethanol, bisphenol A, the hydroquinone-screw (2-hydroxyethyl) ether, hydrogenation bisphenol A, etc. are mentioned, for example As a glycol in which the carbon number of a side chain has long structure, it is DMH, NPG, 2 and 2, and 4-trimethyl, for example. -1, 5-pentanediol, 3-methyl-1,5-pentanediol, a dipropylene glycol, etc. are mentioned. These glycols have especially the desirable thing combined and used.

[0033] In order to make the own glass transition temperature of a polyurethane resin into 100 degrees C or more as an aromatic system diisocyanate compound, It is desirable that it is structural more hard diisocyanate. For example, 2, 4-toluene diisocyanate, 2,6-toluene diisocyanate, a xylene -1, 4-diisocyanate, Xylene -1, 3-diisocyanate, 4, and 4'-diphenylmethane diisocyanate, 2, 4 '-diphenylmethane diisocyanate 4 and 4'-diphenyl ether diisocyanate, 2-nitroglycerine diphenyl -4, 4'-diisocyanate, 2, the 2'-diphenyl propane -4, 4'-diisocyanate, 3, the 3'-dimethyl diphenylmethane -4, 4'-diisocyanate, 4,4'-diphenylpropanediisocyanate, m-phenylene diisocyanate, p-phenylene diisocyanate, naphthylene -1, 4-diisocyanate, naphthylene -1, 5-diisocyanate, 3, 3'-dimethoxy diphenyl -4, 4'-diisocyanate, etc. are mentioned.

[0034] As for the glass transition temperature of this polyurethane resin, it is desirable that it is 100 degrees C or more. The glass transition temperature of a polyurethane resin becomes so high that the ratio of the diol which has the benzene ring and a cyclic structure as a skeleton is made high and carries out a polymerization, while using aromatic diisocyanate, and becomes so high that urethane machine concentration is high. In addition, although especially the upper limit of the glass transition temperature of a polyurethane resin is not limited, it is desirable that it is 180 degrees C.

[0035] It is desirable to introduce into this polyurethane resin the polar group which consists of the third class amine, quarternary ammonium salt, a sulfonic-acid alkali-metal salt, or a carboxylic acid in order to improve the dispersibility of a magnetic layer 1.

[0036] As the third class amine used as a polar-group content active hydrogen compound A fatty amine, an aromatic amine, an alkanolamine, an alkoxy alkylamine, etc. are mentioned. more specifically N-methyldiethanolamine, N-methyl diisopropylamine, A diethylamino propanediol, N-(2-aminoethyl) ethanolamine, N-methylethanol amine, diisopropylamine, a piperazine, a 2-methyl-piperazine, a piperazine (hydroxyethyl), a screw (aminopropyl) piperazine, N-methylaniline, N-methylphenyl amine, etc. are mentioned.

[0037] As quarternary ammonium salt, there is alkylamine-salt and its quarternary-ammonium-salt, aromatic quarternary-ammonium-salt, and heterocycle quarternary ammonium salt etc., and organic acids, such as carboxylic acids other than halogens, such as chlorine, and a bromine, iodine, or a halogen and a phosphoric acid, are also mentioned as counter ion.
[0038] As for the amount of polar groups of the third class amine and quarternary ammonium salt, it is desirable that it is 0.01 mmol/g - 10.0 mmol/g in the weight ratio of a polyurethane resin, and it is more desirable that it is 0.1 mmol/g - 0.5 mmol/g. When there are more amounts of polar groups of the third class amine and quarternary ammonium salt than the above-mentioned value, although the dispersibility of a magnetic layer 1 improves, in case a possibility that coating nature may deteriorate has it and it applies a magnetic paint on the nonmagnetic base material 2, it may be applied, and a stripe may generate it. On the other hand, when there are few amounts of polar groups of the third class amine and quarternary ammonium salt than the above-mentioned value, there is fear that the dispersibility of a magnetic layer 1 is inadequate.
[0039] As a sulfonic-acid alkali-metal salt, sulfonic-acid sodium, a sulfonic-acid potassium, etc. are mentioned. As for the amount of polar groups of a sulfonic-acid alkali-metal salt, it is desirable that it is 0.001 mmol/g - 0.2 mmol/g in the weight ratio of a polyurethane resin, and it is more desirable that it is 0.01 mmol/g - 0.09 mmol/g. When there are few amounts of polar groups of a sulfonic-acid alkali-metal salt than the above-mentioned range, there is fear that the dispersibility of a magnetic layer 1 is inadequate. On the other hand, when the amount of polar groups of a sulfonic-acid alkali-metal salt exceeds the above-mentioned range, the viscosity of a polyurethane resin becomes high, handling gets worse, and there is a possibility that thixotropy may become large. For this reason, there is a possibility that the coating nature of a magnetic layer 1 may deteriorate.
[0040] As for the amount of polar groups of a carboxylic acid, it is desirable that it is 0.001 mmol/g - 0.1 mmol/g in the weight ratio of a polyurethane resin, and it is more desirable that it is 0.01 mmol/g - 0.05 mmol/g. When there are few amounts of polar groups of a carboxylic acid than the above-mentioned range, there is fear that the dispersibility of a magnetic layer 1 is inadequate. On the other hand, when the amount of polar groups of a carboxylic acid exceeds the above-mentioned range, the polar group which consists of a carboxylic acid has a possibility that composition may become difficult in order to act as negative catalysis of an urethane composition reaction.
[0041] The method of introducing a polar group into a polyurethane resin directly by the urethane-ized reaction by making a polar-group content glycol compound, a polar-group content amino-alcohol compound, or a polar-group content diamine compound into a chain elongation agent as a method of introducing into a polyurethane resin the polar group mentioned above is desirable.
[0042] Moreover, when introducing quarternary ammonium salt as a polar group, although there are a method of introducing quarternary ammonium salt directly and the method of forming into 4 class by the alkylating agent etc. after introducing the third class amine into a polyurethane resin, it is effective whichever it is the method. In addition, as an alkylating agent, they are a methyl iodide, an ethyl iodide, an ethyl bromide, and a chlorination p-tosyl. Halo methane system carboxylic acids, such as chloro carbonates, such as alkylating agents, such as p-toluenesulfonic-acid ethyl, trialkyl phosphate, ortho acetic ester, a chloro carbonic acid methyl ester, chloro ethyl-carbonate ester, chloro carbonic acid n-propyl ester, chloro carbonic acid isopropyl ester, and chloro carbonic acid 2-ethoxy ethyl ester, a monochloroacetic acid, and a trifluoroacetic acid, and the ester of those, and trialkyl phosphate are mentioned.
[0043] In addition, as for the content in the magnetic layer 1 of this polyurethane resin, it is desirable that it is the range of 5 weight sections - 30 weight section to the magnetic powder 100 weight section mentioned later, and it is more desirable that it is the range of 5 weight sections - 15 weight section. Moreover, as for the weight ratio of the polyurethane resin to the total amount of binders contained in a magnetic layer, it is desirable that it is 50% or more from the purpose which adjusts the glass transition temperature of a magnetic layer 1 with 100 degrees C or more. When the weight ratio occupied in the binder of a polyurethane resin is less than 50%, there is a possibility that it may become difficult to make the glass transition temperature of a magnetic layer 1 into 100 degrees C or more, and there is a

possibility that desired endurance may not be realized as a magnetic-recording medium.
[0044] The solution synthesis method to which the compound used as the raw material of a polyurethane resin is made to react in arbitrary organic solvents as a synthetic method of compounding a polyurethane resin is mentioned. A solution synthesis method is the method of making mix and dissolve an active hydrogen compound and polar-group content compounds, such as a glycol the polyol component used as the raw material of a polyurethane resin and whose molecular weight are 62-250, into an organic solvent, and specifically, adding and compounding aromatic JISOSHIANETO.
[0045] This polyurethane resin is obtained by making aromatic diisocyanate and an active hydrogen compound react as active hydrogen machine superfluous conditions that the rate of equivalent ratio of the active hydrogen machine in an active hydrogen compound exceeds 1.0 to the isocyanate machine in aromatic diisocyanate. It is conditions required since this active hydrogen machine superfluous condition becomes the compounded polyurethane precursor with active hydrogen machine content, without an isocyanate machine remaining, and, as for the rate of equivalent ratio of the active hydrogen machine in the active hydrogen compound component to the isocyanate machine in a diisocyanate component, it is desirable that it is 1.0-2.0. It is important to blend so that the conditions which are not gelled at the time of polyurethane precursor composition may be determined and this condition may be fulfilled with the poly isocyanate component content with the number of average functional groups of an isocyanate machine and the number of average functional groups of the active hydrogen compound component accompanying triol introduction etc.
[0046] Although the rate of a compounding ratio follows the gelling theory which J.P.Flory, Khum, etc. have calculated theoretically, a polyurethane precursor can be compounded by making the reactant ratio of the reaction machine contained in an aforementioned active hydrogen compound and isocyanate each aforementioned molecule react with the compounding ratio taken into consideration in practice, without gelling.
[0047] As an organic solvent used by the solution synthesis method, toluene besides ketone system solvents, such as a methyl ethyl ketone, a methyl isobutyl ketone, a cyclohexanone, and an acetone, a xylene, a tetrahydrofuran, etc. are mentioned.
[0048] The reaction iron pot to which what equipment may be used as long as the synthetic reaction mentioned above can attain uniformly as a synthetic reactor which performs the synthetic reaction of a polyurethane resin, for example, stirring equipment was attached is mentioned. In order to gather the reaction rate of a synthetic reaction, it is also possible to use the metal catalyst regularly used in manufacture of a polyurethane resin as a catalyst, an amine system catalyst, etc. Moreover, it becomes possible to compound a uniform polyurethane resin by warming suitably the reaction container used for a synthetic reaction at 40 degrees C - 60 degrees C, and controlling the reaction which occurs at an urethane-ized reaction. moreover, various kinds -- double -- in order to press down degree reaction, it is desirable to perform a synthetic reaction under nitrogen-gas-atmosphere mind
[0049] Moreover, the copolymer (a copolymer is only called hereafter.) the compound which has a vinyl group comes to carry out a polymerization to a magnetic layer 1 as a binder contains. As a compound which has a vinyl group, at least one or more kinds in a vinyl chloride, vinyl alcohol, and vinyl acetate are mentioned. Moreover, when vinyl alcohol contains as a compound which has a vinyl group, as for the mole ratio of the vinyl alcohol occupied to a copolymer, it is desirable that it is 5% - 20% of range, and it is more desirable that it is 10% - 20% of range.
[0050] As for the polymerization degree of a copolymer, it is desirable that it is 100 or more and 400 or less range, and it is more desirable that it is 150 or more and 250 or less range. When polymerization degree is less than 100, this low molecular weight constituent deposits on a magnetic tape front face, and there is a possibility of degrading the endurance of a magnetic layer 1. the case where polymerization degree exceeds 400 on the other hand -- the viscosity of a magnetic paint -- high -- becoming -- the dispersibility of a magnetic layer 1 -- falling -- electromagnetism -- there is a possibility of causing degradation of the transfer characteristic
[0051] It is -SO3M, -OSO3M, -COOM, and -OPO3M2 (M shows a hydrogen atom, an alkali-metal atom, or an ammonium salt here.) at the purpose which improves the dispersibility of the magnetic

powder in a magnetic layer 1 in this copolymer. when there is two M, even if mutually the same, you may differ You may introduce at least one or more polar groups chosen from ** etc. It is desirable to introduce -OSO3K and/or -COOH as a polar group especially.
[0052] As for the amount of introduction of the above-mentioned polar group in a copolymer, it is desirable that it is the 0.001-mol % - 5.0-mol range of %, it is more desirable that it is the 0.01-mol % - 5.0-mol range of %, and it is most desirable that it is the 0.05-mol % - 3.0-mol range of %. When the amount of introduction of a polar group is less than [0.001 mol %], there is a possibility that the distributed state of magnetic powder may fall. On the other hand, since a copolymer has hygroscopicity when the amount of introduction of a polar group exceeds 5.0-mol %, there is a possibility that weatherability may fall as a magnetic-recording medium.
[0053] The method of carrying out copolymerization of the monomer which has polar-group and reactant double bond, for example, 2-(meta) acrylamide-isobutane sulfonic acid, vinyl sulfonic-acid and its alkali-metal salt, and acrylic-acid (meta)-2-sulfonic-acid ethyl and its alkali-metal salt, maleic-acid (anhydrous), acrylic-acid, and (meta) acrylic-acid-2-phosphoric ester etc. to a copolymer as a method of introducing a polar group according to well-known technology with the compound which has a vinyl group is desirable.
[0054] In addition, as for the content in the magnetic layer 1 of the copolymer in which the compound which has a vinyl group carried out the polymerization, it is desirable that it is 5 weight sections - 30 weight section to the magnetic powder 100 weight section mentioned later, and it is more desirable that it is 5 weight sections - 15 weight section.
[0055] By the way, especially the thing contained as a binder contained in a magnetic layer 1 combining the polyurethane resin which has the third class amine as a polar group, and the vinyl chloride system copolymer which has an epoxy group as polar groups is desirable.
[0056] The epoxy group in a vinyl chloride system copolymer mainly stabilizes a vinyl chloride system copolymer, and it acts so that the desalting acid reaction of the copolymer which advances with time may be suppressed. Moreover, since the epoxy group in a vinyl chloride system copolymer carries out crosslinking reaction to the third class amine introduced into the polyurethane resin, a polyurethane resin and a vinyl chloride system copolymer construct a bridge. The intensity of a magnetic layer 1 becomes very high by this, and the adhesive property of a magnetic layer 1 and the nonmagnetic base material 2 improves.
[0057] As for the content of the repeat unit which has an epoxy group, in the vinyl chloride system copolymer which has an epoxy group as a polar group, it is desirable that it is the one-mol % - 30-mol range of %. Moreover, as for the ratio of the repeat unit which has an epoxy group to one mol of vinyl chloride repeat units which constitute a vinyl chloride system copolymer, it is desirable that it is the range of 0.01 mols - 0.5 mols, and it is more desirable that it is a 0.01 mols - 0.3 mol range.
[0058] In addition, after usually carrying out partial dehydrochlorination of the method and vinyl chloride system polymer which perform copolymerization for each raw material monomer in a radical polymerization by contact to heating or a dehydrochlorination agent as a method of introducing an epoxy group, using glycidyl (meta) acrylate as a monomer which has a reactant double bond and an epoxy group, the method of carrying out epoxidation by epoxidation agents, such as a fault carboxylic acid, etc. is mentioned. Here, MR-110, MR-113, MR-104 (Nippon Zeon Co., Ltd. make), etc. are specifically mentioned as a vinyl chloride system copolymer which has an epoxy group as a polar group.

[0059] Moreover, a magnetic layer 1 can contain resins whose glass transition temperatures are 150 degrees C or more, such as a nitrocellulose and an alkyl cellulose, besides the copolymer which has the polyurethane resin mentioned above as a binder, and a vinyl group. Thereby, the magnetic-recording medium of intensity of a magnetic layer 1 improves more, and it has the more excellent endurance.
[0060] As for this magnetic layer 1, it is desirable to contain an isocyanate compound as a curing agent, in order to raise the solvent resistance of a magnetic-recording medium, and it is desirable to specifically contain a two or more average functional-group numbers isocyanate compound. That is, each polyol adduct of the polymeric object of the poly isocyanate or the poly isocyanate can be used suitably.

[0061] Moreover, if an isocyanurate machine is introduced into an isocyanate compound, thermal resistance and endurance will improve. Here, when the isocyanurate machine of the rate of a constant ratio and/or other isocyanate polymers are included in the poly isocyanate compound molecule, the branch point of the grade which does not reach gelling can be introduced into the generated polyurethane system component.
[0062] As an isocyanate compound, an aromatic poly isocyanate, an aliphatic poly isocyanate, etc. are mentioned. Moreover, the adduct of these and an active hydrogen compound is desirable. As an aromatic poly isocyanate, toluene diisocyanate, 1, 3-xylenediisocyanate, 1, 4-xylenediisocyanate, 4, and 4'-diphenylmethane diisocyanate, p-phenyl diisocyanate, m-phenyl diisocyanate, 1, and 5-naphthyl diisocyanate etc. can be mentioned. Moreover, as an aliphatic poly isocyanate, hexamethylene di-isocyanate, dicyclohexylmethane diisocyanate, cyclohexane diisocyanate, isophorone diisocyanate, etc. can be mentioned. Moreover, as an active hydrogen compound which forms the above-mentioned aromatic poly isocyanate or an aliphatic poly isocyanate, and an adduct, ethylene glycol, 1, 4-butanediol, 1, 3-butanediol, neopentyl glycol, a diethylene glycol, a trimethylol propane, a glycerol, etc. are mentioned. In addition, as for the active hydrogen compound average molecular weight which forms an adduct, it is desirable that it is the range of 100-5000.
[0063] As for the addition of the isocyanate compound used as a curing agent, it is desirable to consider as the 20 or less sections by the weight ratio of a binder, and considering as the 10 or less sections is more desirable. Here, a theory top is a curing agent weight used as the active hydrogen in a polyurethane-resin constituent (or binder resin constituent), and the amount of isocyanates of the equivalent, and serves as sufficient addition. However, on actual manufacture, in order that the isocyanate of a curing agent component may react with moisture etc., the amount of isocyanates of active hydrogen and the equivalent is inadequate in many cases, and it is effective to add the curing agent of an excessive amount 10% to 50% from the active hydrogen equivalent.
[0064] Furthermore, when the poly isocyanate compound is used as a curing agent, the adhesive property of a magnetic layer 1 and the nonmagnetic base material 2 becomes stronger after coating a magnetic paint by promoting a hardening reaction at the temperature of 40 degrees C - 80 degrees C for several hours.
[0065] Ferromagnetic powder, such as a ferromagnetic alloy which makes a principal component gamma-FeOx (x=1.33-1.5), Co denaturation gamma-FeOx (x=1.33-1.5), Fe and nickel, or Co, and contains it 75% or more as magnetic powder contained in a magnetic layer 1, a barium ferrite, and a strontium ferrite, is mentioned. These magnetic powder may contain atoms, such as aluminum, Si, S, Sc, Ti, V, Cr, Cu, Y, Mo, Rh, Pd, Ag, Sn, Sb, Te, Ba, nickel, Ta, W, Re, Au, Hg, Pb, Bi, La, Ce, P, Mn, Zn, Co, Sr, and B, besides a predetermined atom.
[0066] It is desirable to use ferromagnetic metal magnetism powder as magnetic powder especially, and it is desirable that the ranges of the amount of saturation magnetization are more than sigmas=100Am2/kg and not more than 200Am2/kg, the specific surface area by the BET adsorption method is the range of 60m2/g more than 45m2/g, and the ranges of a coercive force are 90 or more kA/m and 200 kA/m or less.
[0067] A magnetic layer 1 may contain an abrasive material. An alpha alumina, a beta alumina, a fused alumina, silicon carbide, a chrome oxide, a cerium oxide, alpha-iron oxide, corundum, a diamond, a quartzite, a garnet, a silicon nitride, boron nitride, carbonization molybdenum, a boron carbide, a tungsten carbide, titanium oxide, etc. may be used for the material and the concrete target whose Mohs hardness is six or more as an abrasive material, such material may be used independently, and you may use it combining plurality.
[0068] Although it is desirable that it is the range of 0.01 micrometers - 2 micrometers as for the mean particle diameter of these abrasive materials, the abrasive material from which grain size differs if needed can be combined, or an independent abrasive material can also extend particle size distribution, and it can use.
[0069] A magnetic layer 1 may contain an antistatic agent. As an antistatic agent, well-known material, such as carbon black, a natural surfactant, a Nonion nature surfactant, and a cation nature surfactant, can

be used.
[0070] Acetylene black, furnace black, etc. are mentioned as carbon black. For the DBP oil absorption of this carbon black, it is that they are 30ml / 100g - 150ml / 100g. It is more desirable that they are 50ml / 100g - 150ml / 100g. When DBP oil absorption exceeds 150ml / 100g, the viscosity of a magnetic paint becomes high and there is a possibility that the dispersibility of a magnetic layer 1 may fall remarkably. On the other hand, when DBP oil absorption is 50ml / less than 100g, this fear has time in the distributed process which distributes the component of a magnetic paint.
[0071] Moreover, as for the mean particle diameter of carbon black, it is desirable that it is 5nm - 150nm, and it is more desirable that it is 15nm - 50nm. When a mean particle diameter exceeds 150nm, there is a possibility that the front-face nature of a magnetic layer 1 may deteriorate. On the other hand, although it becomes good [the front-face nature of a magnetic layer 1] when a mean particle diameter is less than 5nm, there is a possibility of being hard to distribute in a magnetic layer 1. Furthermore, as for the specific surface area (a BET value is called hereafter.) by the bull NAUWAE helmet teller method (a BET adsorption method is called hereafter.), it is desirable that it is 40mm2/g-300mm2/g, and it is more desirable that it is 100mm2/g250mm2/g. Moreover, as for a water content, it is desirable that it is 0.1% - 10%, as for tap density, it is desirable that it is 0.1g/cc - 1g/cc, and, as for pH, it is desirable that it is 2.0-10.
[0072] As carbon black which fulfills the above conditions For example, RAVEN1250 (the particle size of 23nm) by the colon BIAN carbon company BET value 135.0m2/g, the DBP oil absorption of 58.0ml / 100g, RAVEN1255 (2/g the particle size of 23nm, and the BET value of 125.0m) The DBP oil absorption of 58.0ml / 100g, RAVEN1020 (the particle size of 27nm) BET value 95.0m2/g, the DBP oil absorption of 60.0ml / 100g, RAVEN1080 (particle-size [of 28nm], and BET value 78.0m2/g, DBP oil absorption of 65.0ml / 100g), RAVEN1035, RAVEN1040, RAVEN1060, RAVEN3300, RAVEN450, RAVEN780 grade, Or the KONDAKU tech (CONDUCTEX) (particle-size [of 20nm] and BET value 220.0m2/g, DBP oil absorption of 115.0ml / 100g) SC is sufficient. Moreover, #80 by the Asahi carbon company (2/g the particle size of 23nm, and the BET value of 117.0m) The DBP oil absorption of 113.0ml / 100g, Mitsubishi Kasei #22B (the particle size of 40nm) BET value 5.0m2/g, the DBP oil absorption of 131.0ml / 100g, # 20B (particle-size [of 40nm], and BET value 56.0m2/g, DBP oil absorption of 115.0ml / 100g), Black PARUZU L by Cabot Corp. (BLACK PEARLS) (the particle size of 24nm) BET value 250.0m2/g, the DBP oil absorption of 60.0ml / 100g, Black PARUZU 800 (particle-size [of 17nm] and BET value 240.0m2/g, DBP oil absorption of 75.0ml / 100g), black PARUZU 1000, black PARUZU 1100, black PARUZU 700, and black PARUZU 905 grade are sufficient.
[0073] A magnetic layer 1 may contain a coupling agent. As a coupling agent, a silane coupling agent, a titanate system coupling agent, an aluminate coupling agent, etc. are mentioned, for example.
[0074] As a silane coupling agent, amino silane compounds, such as epoxy silane compounds, such as vinylsilane compounds, such as gamma-meta-KURIROKISHIPURI pill trimethoxysilane and vinyltriethoxysilane, and beta-(3, 4-epoxycyclohexyl) ethyl trimethoxysilane, gamma-glycidoxypropyltrimetoxysilane, and gamma-aminopropyl triethoxysilane, a N-beta (aminoethyl) gamma-aminopropyl methyl JIMEKISHI silane, mercapto silane compounds, such as gamma-mercapto propyltrimethoxysilane, etc. are mentioned.
[0075] As a titanate system coupling agent, tetra-n-butoxytitanium, Tetraisopropoxy titanium, screw [2-[(2-aminoethyl)AMINO] ETANO rate] and [2-[(2-aminoethyl) amino ETANO rate-O] (2-PUROPANO rate) titanium, Tris (iso octadecanoate-O) (2-PUROPANO rate) titanium, Screw (JITORI desyl phosphite-O") tetrakis (2-PUROPANO rate) dihydro ZENCHITANETO, Screw (dioctyl phosphite-O") tetrakis (2-PUROPANO rate) dihydro ZENCHITANETO, Tris (dioctyl phosphite-O") (2-PUROPANO rate) titanium, Screw (dioctyl phosphite-O") [1, 2-ethane diolate (2-)-O, O'] titanium, Tris (dodecylbenzene sulfonate-O) (2-PUROPANO rate) titanium, tetrakis [2, and 2-screw [(2-propenyloxy) methyl]-1-BUTANO rate titanate etc. is mentioned. Moreover, the plain act KR TTS by Ajinomoto Co., Inc., KR 46B, KR 55, KR 41B, KR 38S, KR138S, KR 238S and 338X, KR 12, KR 44, KR 9SA, and KR 34S grade are also usable.

[0076] Aceto alkoxy aluminum JIISOPUROPIRETO etc. is mentioned as an aluminate coupling agent. Moreover, plain act AL-M by Ajinomoto Co., Inc. etc. is usable.
[0077] As for the addition of a coupling agent, it is desirable that it is the range of the 0.05 weight section - 10.0 weight section to the magnetic powder object 100 weight section, and it is more desirable that it is the range of the 0.1 weight sections - 5.0 weight section.
[0078] A magnetic layer 1 can contain lubricant. Or lubricant may be applied to magnetic layer 1 front face. As lubricant, amine system lubricant, such as fluorine system lubricant, such as higher-fatty-acid ester, a silicone oil, fatty-acid denaturation silicone, and fluorine content silicone, a polyolefine, a polyglycol, an alkyl phosphoric ester and its metal salt, a polyphenyl ether, fluoridation alkyl ether, an alkyl carboxylic-acid amine salt, and a fluoridation alkyl carboxylic-acid amine salt, the alcohols (you may branch, although an unsaturation is included.) of carbon numbers 12-24, the higher fatty acid of carbon numbers 12-24, etc. are raised, for example.
[0079] Moreover, as the above-mentioned higher-fatty-acid ester, it is high-class fat ester (you may branch, although an unsaturation is included, respectively.) of carbon numbers 12-32. For example, a lauric acid, a myristic acid, a palmitic acid, stearin acid, isostearic acid, Arachin acid, oleic acid, the Aye Ko acid, an elaidic acid, a HEBEN acid, linolic acid, Methyl esters, such as the Reno Laing acid, ethyl ester, propyl ester, It passes and PUCHIRU ester, octyl ester, etc. are raised. isopropyl ester, butyl ester, pentyl ester, and hexyl ester -- specifically A butyl stearate, a stearin acid pentyl, a stearin acid heptyl, a stearin acid octyl, a stearin acid iso octyl, stearin acid butoxy ethyl, a myristic-acid octyl, a myristic-acid iso octyl, palmitic-acid butyl, etc. are raised. These lubricant is usable, even if you may use it independently and it mixes with two or more lubricant.
[0080] In addition, a magnetic layer 1 can contain a rusr-proofer conventionally well-known besides the binder mentioned above, an additive, etc.
[0081] Moreover, as for the surface roughness Ra of a magnetic layer 1, it is desirable that it is the range of 3nm or more and 7nm or less. In addition, the surface roughness of a magnetic layer 1 is Ra in the center line average coarseness which contact edge radius of curvature measured using the contact process surface roughness meter by the sensing pin which is 2 micrometers.
[0082] This magnetic-recording medium was having record reproduction made using the record wavelength of short wavelength, and aims at advance of digitization in recent years, and achievement of the high-density high capacity corresponding to Hi-Vision. the irregularity with magnetic layer 1 very small front face -- the cause of a spacing loss -- becoming -- electromagnetism -- the transfer characteristic and C/N may deteriorate Then, calender processing which smooths magnetic layer 1 front face using the metal roll which is high temperature is performed, and magnetic layer 1 front face is smoothed so that surface roughness may serve as the above-mentioned range.
[0083] Since magnetic layer 1 front face is mirror-plane-ized too much when the surface roughness of a magnetic layer 1 is less than 3nm, friction with a head, a drum, etc. goes up, there is a possibility of producing a ball up to these slide member, and running may become poor. the case where the surface roughness of a magnetic layer 1 exceeds 7nm on the other hand -- a spacing loss -- being generated -- the electromagnetism of a magnetic-recording medium -- there is a possibility that the transfer characteristic may get worse therefore, when the surface roughness of a magnetic layer 1 is the above-mentioned range, a spacing loss prevents a magnetic-recording medium -- having -- good electromagnetism -- it has the transfer characteristic
[0084] As a nonmagnetic base material 2, for example Polyester, such as a polyethylene terephthalate and polyethylenenaphthalate Polyolefines, such as polyethylene and polypropylene, a cellulose triacetate, Cellulosics, such as a cellulose diacetate and a cellulose acetate butylate, Vinyl system resins, such as a polyvinyl chloride and a polyvinylidene chloride, a polycarbonate, A polyimide, a polyamidoimide, other plastics, aluminum, Light alloys, such as metals, such as copper, an aluminium alloy, and a titanium alloy, ceramics, single crystal silicon, etc. have each material more nearly usable than before currently used as a nonmagnetic base material 2 of this kind of magnetic-recording medium.
[0085] With the field in which the magnetic layer 1 of the nonmagnetic base material 2 is formed, you may prepare the nonmagnetic back-coat layer which is not illustrated in the field of an opposite side at a

magnetic-recording medium. It is possible to use a material better known than before as a back-coat layer, as for the thickness of a back-coat layer, it is desirable that it is 0.1 micrometers - 2.0 micrometers, and it is more desirable that it is 0.3 micrometers - 1.0 micrometers.
[0086] The magnetic-recording medium constituted as mentioned above applies a magnetic paint on the nonmagnetic base material 2, and a magnetic layer 1 is formed.
[0087] This magnetic paint distributes magnetic powder and a binder in a solvent at least, and is prepared. In case a magnetic paint is prepared, a roll mill, a ball mill, a sand mill, a TRON mill, a high-speed stone mill, a basket mill, a dace spa, a homomixer, a kneader, a continuation kneader, an extruder, a homogenizer, an ultrasonic disperser, etc. are used as a distributed kneading machine.
[0088] As the method of application which applies the magnetic paint prepared as mentioned above on the nonmagnetic base material 2, an air doctor coat, a blade coat, a rod coat, a knockout coat, an air knife coat, a squeeze coat, a sinking-in coat, a reverse roll coat, a gravure coat, a transfer roll coat, a cast coat, etc. are mentioned.
[0089] Moreover, before applying a magnetic paint, you may pretreat corona discharge processing, electron-beam-irradiation processing, etc. on the nonmagnetic base material 2.
[0090] Although **** explained the monolayer application type magnetic-recording medium which comes to form a magnetic layer 1 on the nonmagnetic base material 2, this invention is applicable also to multistory application type magnetic-recording intermediation equipped with the interlayer of one or more layers, if few between a nonmagnetic base material and a magnetic layer. Here, as an interlayer, it may be good and a magnetic layer is sufficient in a nonmagnetic layer. In addition, since multistory application type the nonmagnetic base material and magnetic layer in a magnetic-recording medium are the same composition as a monolayer application type magnetic-recording medium, the nonmagnetic base material 2, and a magnetic layer 1, they omit explanation by ****** which attaches a same sign.
[0091] When an interlayer is a nonmagnetic monolayer, a this multistory application type magnetic-recording medium is equipped with the nonmagnetic base material 2, the non-magnetic layer 3 formed on the nonmagnetic base material 2, and the magnetic layer 1 formed on the non-magnetic layer 3 as shown in drawing 2 .
[0092] Since it is formed on the non-magnetic layer 3 formed on the nonmagnetic base material 2, the magnetic layer 1 is thin-film-ized. As for the thickness of the magnetic layer 1 in a multistory application type magnetic-recording medium, it is desirable that it is 0.5micro or less. thereby -- electromagnetism -- the magnetic-recording medium excellent in the transfer characteristic is obtained
[0093] A non-magnetic layer 3 applies the nonmagnetic paint containing nonmagnetic powder and a binder on the nonmagnetic base material 2, and is formed. In order to know that the shape of surface type of a non-magnetic layer 3 will do influence to the shape of surface type of a magnetic layer 1 strongly by the multistory application type magnetic-recording medium and to form the smooth magnetic layer 1, it is indispensable to form the smooth non-magnetic layer 3. Therefore, the material of a non-magnetic layer 3 is chosen in consideration of such surface smoothing.
[0094] As nonmagnetic powder, there are the nonmagnetic iron oxide of alpha-Fe 2O3 grade, a goethite, a rutile type titanium dioxide, anatase type titanium oxide, a tin oxide, a tungstic oxide, oxidization silicon, a zinc oxide, a chrome oxide, a cerium oxide, titanium carbide, BN, an alpha alumina, a beta alumina, gamma-alumina, a calcium sulfate, a barium sulfate, molybdenum disulfide, a magnesium carbonate, a calcium carbonate, a barium carbonate, a strontium carbonate, a barium titanate, etc., for example, and these powder is possible also for using independently, and can also mix and use
[0095] This nonmagnetic powder may be made to dope a suitable quantity of an impurity according to the purpose, and surface treatment may be carried out to it with compounds, such as aluminum, Si, Ti, Sn, Sb, and Zr, for the purpose, such as improvement of dispersibility, conductive grant, and an improvement of a color tone. Moreover, as for the specific surface area of nonmagnetic powder, it is desirable that it is the range of g-80m2/[of 30m2/] g, and it is more desirable that it is the range of g-70m2/[of 40m2/] g.
[0096] A non-magnetic layer 3 may contain the same carbon black as a magnetic layer 1 if needed. As for the specific surface area of the carbon black contained in a non-magnetic layer 3, it is desirable that it

is the range of g-400m2/[of 100m2/] g, and, as for DBP oil absorption, it is desirable that it is the range of 20ml / 100g - 200ml / 100g. The nonmagnetic powder and carbon black which have the specific surface area of the above-mentioned range are accompanied by atomization of a configuration. Therefore, since a non-magnetic layer 3 contains the nonmagnetic powder and carbon black which atomized, it is smoothed, and smoothing of a magnetic layer 1 of it becomes possible. Consequently, it is possible for modulation noise figure to be excellent and to obtain a magnetic-recording medium with little influence of a spacing loss.

[0097] Nonmagnetic powder does not have magnetic cohesive force, but although distribution is easy compared with ferromagnetic powder, when specific surface area is larger than the above-mentioned range, even if it uses the technique of this invention, distribution of fine particles becomes difficult. On the other hand, if specific surface area is too small, the surface smooth nature which can be equal to high-density record is not securable.

[0098] The binder contained in a non-magnetic layer 3 is distributing various pigments, such as nonmagnetic powder. The well-known thermoplastics used as a binder contained in a non-magnetic layer 3 as a binder generally contained in the non-magnetic layer 3 for magnetic-recording media, thermosetting resin, a reaction type resin, etc. are usable, and it is desirable that number average molecular weight is 5000-100000.

[0099] As an example of thermoplastics, a vinyl chloride, vinyl acetate, a vinyl chloride vinyl acetate copolymer, A vinyl chloride vinylidene chloride copolymer, a vinyl chloride-acrylonitrile copolymer, An acrylic-ester-acrylonitrile copolymer, an acrylic-ester-vinyl chloride vinylidene chloride copolymer, A vinyl chloride-acrylonitrile copolymer, an acrylic-ester-acrylonitrile copolymer, An acrylic-ester-vinylidene-chloride copolymer, a methacrylic-ester-vinylidene-chloride copolymer, A methacrylic-ester-vinyl chloride copolymer, a methacrylic-ester-ethylene copolymer, A polyvinyl fluoride, a vinylidene-chloride-acrylonitrile copolymer, an acrylonitrile-butadiene copolymer, polyamide resin, a polyvinyl butyral, and a cellulosic (a cellulose acetate butylate --) Cellulose die acetate, a cellulose triacetate, cellulose propionate, a nitrocellulose, a styrene butadiene copolymer, a polyurethane resin, polyester resin, amino resin, synthetic rubber, etc. are mentioned. Moreover, as an example of thermosetting resin or a reaction type resin, phenol resin, an epoxy resin, a polyurethane hardening type resin, a urea-resin, melamine resin, an alkyd resin, silicone resin, a polyamine resin, a formaldehyde resin, etc. are mentioned.

[0100] Moreover, the polar functional group of -SO3M, -OSO3M, -COOM, and P=O(OM) 2 grade may be introduced into the binder contained in a non-magnetic layer 3 in order to raise the dispersibility of pigments, such as nonmagnetic powder. (The inside M of a formula is alkali metal, such as a hydrogen atom or a lithium, a potassium, and sodium,.) further -- the above -- polarity -- a functional group -- ****** -- - -- NR -- one -- R -- two -- - -- NR -- one -- R -- two -- R -- three -- + -- X -- - -- etc. etc. -- an end group -- having -- a side chain -- type -- a thing -- > -- NR -- one -- R -- two -- + -- X -- - -- Here, the inside R1, R2, and R3 of a formula is a hydrogen atom or a hydrocarbon group, and X- is halogen ion, such as a fluorine, chlorine, a bromine, and iodine, or inorganic and organic ion. Moreover, there are also polar functional groups, such as -OH, -SH, -CN, and an epoxy group. As for the amount of these polarity functional group, it is desirable that it is the range of 10-1 mol/g - 10-8 mol/g to a binder, and it is more desirable that it is the range of 10-2 mol/g - 10-6 mol/g.

[0101] The non-magnetic layer 3 is possible also for containing these binders by the one-sort independent, and can also use together and contain two or more sorts. Moreover, as for the content of the binder in a non-magnetic layer 3, it is desirable that it is the range of the 1 weight section - 200 weight section to the nonmagnetic powder 100 weight section, and it is desirable that it is the range of 10 weight sections - 50 weight section.

[0102] A non-magnetic layer 3 can contain an aluminum oxide (alpha, beta, gamma), a chrome oxide, a silicon carbide, a diamond, a garnet, emery, boron nitride, titanium carbide, a silicon carbide, a titanium carbide, titanium oxide (a rutile, anatase), etc. as a nonmagnetic reinforcement particle. As for the content of a nonmagnetic reinforcement particle, it is desirable that they are below 20 weight sections to the nonmagnetic powder 100 weight section, and it is more desirable that they are below 10 weight

sections. Moreover, as for the Mohs hardness of a nonmagnetic reinforcement particle, it is desirable that it is four or more, and it is desirable that it is five or more. As for the specific gravity of a nonmagnetic reinforcement particle, it is desirable that it is the range of 2-6, it is more desirable that it is the range of 3-5, as for a mean particle diameter, it is desirable that it is 1.0 micrometers or less, and it is more desirable that it is 0.5 micrometers or less. In addition, using the transmission-electron-microscope photograph, statistics processing was measured and carried out and it asked for the mean particle diameter of a nonmagnetic reinforcement particle.

[0103] Moreover, a non-magnetic layer 3 can contain the same lubricant as the magnetic layer 1 mentioned above, an antistatic agent, a dispersant, coupling agent, etc. Furthermore, it is possible to form under coats, such as an adhesives layer, between a non-magnetic layer 3 and the nonmagnetic base material 2.

[0104] In addition, the contact nature of a magnetic-recording medium and a head is decided by hardness (glass-transition-temperature property including viscoelasticity) of the whole magnetic-recording medium including the nonmagnetic base material 2 or the non-magnetic layer 3 grade. By the multistory application type magnetic-recording medium, by adjusting the glass transition temperature of a non-magnetic layer 3, even if it is the case that the glass transition temperature of a magnetic layer 1 is extremely high, degradation of contact nature is prevented.

[0105] The multistory application type magnetic-recording medium constituted as mentioned above applies a nonmagnetic paint on the nonmagnetic base material 2, a non-magnetic layer 3 is formed, on a non-magnetic layer 3, a magnetic paint is applied and a magnetic layer 1 is formed.

[0106] In case a magnetic paint and a nonmagnetic paint are prepared, the same thing as the distributed kneading machine mentioned above is used. As the method of application which applies a magnetic paint and a nonmagnetic paint, an air doctor coat, a blade coat, a rod coat, a knockout coat, an air knife coat, a squeeze coat, a sinking-in coat, a reverse roll coat, a gravure coat, a transfer roll coat, a cast coat, etc. are mentioned. Moreover, the simultaneous multistory application by the knockout coat is sufficient. Moreover, it is desirable to carry out the simultaneous multistory application using the die coating machine. In addition, as lip composition of a die coating machine, both 2 lip methods 3 lip methods 4 lip methods, etc. are usable.

[0107] Moreover, before applying a nonmagnetic paint, you may pretreat corona discharge processing, electron-beam-irradiation processing, etc. on the nonmagnetic base material 2.

[0108] Thus, a glycol and aromatic system diisocyanate carry out the polymerization of the manufactured magnetic-recording medium as a binder, and it is equipped with the magnetic layer 1 containing the polyurethane resin whose urethane machine concentration is 3 or more mmol/g, and the copolymer the compound which has a vinyl group comes to carry out a polymerization, since the glass transition temperature of a magnetic layer 1 is 100 degrees C or more, its dispersibility of a magnetic layer 1 is high, and the intensity of a magnetic layer 1 is very high [a glass transition temperature]. Moreover, since a magnetic layer 1 contains the binder which combined the above-mentioned polyurethane resin and the above-mentioned copolymer, the coating nature of a magnetic layer 1 improves, surface smooth nature becomes good and the adhesive property of a magnetic layer 1 and a non-magnetic layer 3 improves by the monolayer application type magnetic-recording medium by the adhesive property of a magnetic layer 1 and the nonmagnetic base material 2, and the multistory application type magnetic-recording medium. therefore, the bottom of a service condition with this special magnetic-recording medium -- also setting -- usable endurance -- having -- the optimal electromagnetism for high-density record -- it has the transfer characteristic

[0109] Moreover, by containing as a binder the above-mentioned polyester which has at least one or more kinds in the third class amine, quarternary ammonium salt, a sulfonic-acid alkali-metal salt, or a carboxylic acid as a polar group, the viscosity of a magnetic paint falls and the dispersibility of a magnetic-recording medium of a magnetic layer 1 improves more. therefore, the magnetic layer 1 by which magnetic powder distributed the magnetic-recording medium highly, and high-density restoration was carried out -- having -- electromagnetism -- the transfer characteristic improves very much

[0110] A magnetic-recording medium furthermore, by containing as a binder contained in a magnetic

layer 1 combining the polyurethane resin which has the third class amine as a polar group, and the vinyl chloride system copolymer which has an epoxy group as polar groups the intensity of a magnetic layer 1 is markedly alike, and becomes high, and by the monolayer application type magnetic-recording medium, by the adhesive property of a magnetic layer 1 and the nonmagnetic base material 2, and the multistory application type magnetic-recording medium, since the adhesive property of a magnetic layer 1 and a non-magnetic layer 3 is markedly alike and improves, the bottom of a special service condition is certainly equipped with usable endurance

[0111] thin-film-izing of a magnetic layer 2 is possible for a magnetic-recording medium further again by having a non-magnetic layer 3 as an interlayer between a non-magnetic layer 1 and a magnetic layer 2 -- becoming -- electromagnetism -- the transfer characteristic improves sharply

[0112]

[Example] The magnetic-recording medium concerning this invention is explained in detail based on a concrete experimental result. Here, two or more equipped with magnetic layer and nonmagnetic base material monolayer application type magnetic tapes and multistory application type magnetic tapes equipped with a magnetic layer, a non-magnetic layer, and a nonmagnetic base material were produced as a magnetic-recording medium which applied this invention.

[0113] First, as a binder which a magnetic paint is made to contain, below, as the polyurethane resin and the vinyl chloride system copolymer were shown below, they were compounded.

[0114] The [synthetic method of a polyurethane resin] Here, the polyurethane resin was compounded by the solution synthesis method using the synthetic reactor equipped with the container which the agitator, the thermometer, and the N2 seal pipe attached.

[0115] First, it mixed at a predetermined rate which shows a predetermined glycol component and a predetermined polar-group content compound in Table 1 - 3 shown later, it dissolved into the methyl ethyl ketone, and considered as the solution of 60 % of the weight of solid contents. Next, dibutyl tin JIRAURI rate 10ppm were added, and it agitated as temperature of 70 degrees C. And predetermined aromatic diisocyanate was added into this glycol mixture, it was referred to as R value (OH mol / NCO mol) =0.95, and churning was continued as temperature of 70 degrees C for 24 hours.

[0116] Minute amount extraction of the polyurethane resin was carried out from this reaction mixture, it dissolved 0.1% of the weight into the tetrahydrofuran, and polystyrene conversion molecular weight was measured by the gel permeation chromatography (it is hereafter called GPC for short.). And aromatic diisocyanate was added suitably and the reaction was continued so that it might be set to 20000-80000 with number average molecular weight (Mn), and it diluted with the stage used as target molecular weight to 30% of solid contents using the equivalent mixed solvent of a methyl ethyl ketone and toluene, and various polyurethane resins were compounded.

[0117] Below, as the glass transition temperature of the various polyurethane resins compounded as mentioned above was shown below, it was measured.

[0118] [Glass-transition-temperature measuring method of a polyurethane resin] After applying in the mold release paper first by making polyurethane-resin liquid (solid-content about 30 wt(s)%) into the thickness of about 30 micrometers - 50 micrometers, Dry as temperature of 60 degrees C for 1 hour, dry as temperature of 120 degrees C further for 2 hours, and a clear film is produced. With the dynamic viscoelasticity measuring instrument (tradename : RHEOVIBRON MODEL RHEO -2000, the product made from ORIENTEC), the glass transition temperature of various polyurethane resins was measured as 35Hz of test frequencies, 2.0 degrees C of programming rates, and min.

[0119] The constituent, the urethane machine concentration, the glass transition temperature, and GPC molecular weight of the various polyurethane resins (PU1-PU21) compounded as mentioned above are shown in Table 1 - 3.

[0120]

[Table 1]

ポリウレタン		PU1	PU2	PU3	PU4	PU5	PU6	PU7
グリコール (モル比)		DMH/NPG 8/2	DMH/NPG 8/2	DMH/NPG 8/2	DMH/NPG 5/5	DMH 1	DMH 1	DMH 1
極性基含有化合物 極性基量(mmol/g)		DEAPD 0.2	NMDEA 0.2	DMPA 0.01	SO_3Na 0.1	DEAPD 0.2	DEAPD 0.5	NMDEA 0.2
芳香族ジイソシアネート (モル比)		MDI 0.95	MDI 0.95	MDI 0.95	MDI 0.95	MDI 0.96	TDI 0.97	MDI 0.95
ウレタン基濃度(mmol/g)		4.8	4.8	4.8	3.5	4.8	5.2	5.3
ガラス転移温度(Tg)		120	120	120	100	120	120	140
GPC分子量	Mn($\times 10^4$)	24000	30000	32000	21000	31000	40000	22000
	Mw($\times 10^4$)	48000	60000	64000	42000	62000	80000	44000

[0121]
[Table 2]

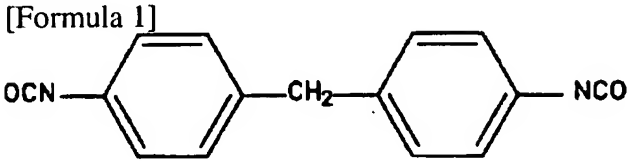
ポリウレタン		PU8	PU9	PU10	PU11	PU12	PU13
グリコール (モル比)		CHDM 1	ビスフェノールA 1	CHDM/EG 7/3	DMH 1	DMH 1	CHDM 1
極性基含有化合物 極性基量(mmol/g)		NMDEA 0.5	NMDEA 0.1	NMDEA 0.2	DEAPD+PTSM 0.2	DEAPD 0.5	NMDEA+PTSM 0.2
芳香族ジイソシアネート (モル比)		MDI 0.96	MDI 0.94	TDI 0.96	MDI 0.96	MDI 0.97	TDI 0.95
ウレタン基濃度(mmol/g)		5.3	3.0	6.5	4.8	5.2	5.3
ガラス転移温度(Tg)		140	155	170	120	120	140
GPC分子量	Mn($\times 10^4$)	28000	15000	30000	31000	40000	22000
	Mw($\times 10^4$)	58000	30000	60000	62000	80000	44000

[0122]
[Table 3]

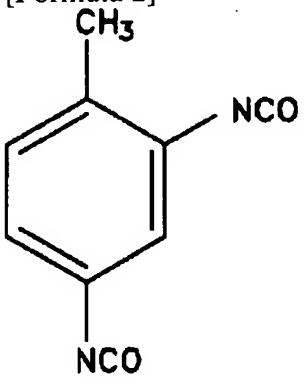
ポリウレタン		PU14	PU15	PU16	PU17	PU18	PU19	PU20	PU21
グリコール (モル比)		ポリエステル1 10	ポリエステル1 5	ポリエステル2 20	ポリエステル2 10	DMH 5	DMH 7	CHDM 7	CHDM 5
グリコール (モル比)		NPG 10	NPG 10	DMH 10	DMH 10	HG 5	HG 3	EG 3	EG 5
極性基含有化合物 極性基量(mmol/g)		DEAPD 0.2	DEAPD 0.2	DEAPD 0.2	DEAPD 0.2	NMDEA 0.2	NMDEA 0.2	NMDEA 0.2	NMDEA 0.2
芳香族ジイソシアネート (モル比)		MDI 0.97	MDI 0.97	MDI 0.97	MDI 0.97	MDI 0.96	MDI 0.96	MDI 0.96	MDI 0.96
ウレタン基濃度(mmol/g)		2.3	2.9	1.1	1.6	6.5	6.5	6.5	6.5
ガラス転移温度(Tg)		-20	0	20	5	90	100	180	185
GPC分子量	Mn($\times 10^4$)	25000	26000	30000	31000	30000	29000	31000	30000
	Mw($\times 10^4$)	50000	52000	60000	62000	60000	58000	62000	60000

[0123] In addition, for a dimethanol heptane and NPG, neopentyl glycol and CHDM are [DMH called for short as a glycol component in Table 1 - 3 / ethylene glycol and HG of cyclohexane dimethanol and EG] hexandiol. Moreover, polyester 1 is an adipate (molecular weight Mn=1000) of 1 and 4-butanediol, and polyester 2 is isophthalic-acid ester (molecular weight Mn=2000) of 1 and 4-butanediol.
[0124] Furthermore, in a diethylamino propanediol and NMDEA, N-methyldiethanolamine and DMPA show a dimethanol pro-on acid, PTSM shows [DEAPD called for short as a polar-group content compound] a p-toluenesulfonic-acid methyl (however, it considered as quarternary ammonium salt by the fourth class-ized agent.), and SO3Na is DMIS content polyester (an isophthalic acid / NPG/DMIS

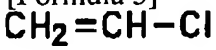
molecular weight 1000).
[0125] Moreover, MDI called for short as aromatic diisocyanate is 4 and 4'-diphenylmethane diisocyanate shown in ** 1.
[0126]
[Formula 1]



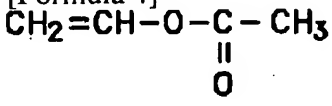
[0127] Moreover, TDI is toluene diisocyanate shown in ** 2.
[0128]
[Formula 2]



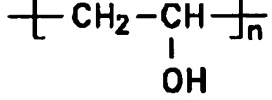
[0129] [The synthetic method of a vinyl chloride system copolymer] It mixed at a predetermined rate which shows as a monomer the vinyl chloride shown in the following-ization 3, the vinyl acetate shown in the following-ization 4, the vinyl alcohol shown in the following-ization 5 which is a vinyl chloride denaturation article, and the glycidyl methacrylate shown in the following-ization 6 which has a reactant double bond and an epoxy group in Table 4 shown later, the polymerization was carried out until it became predetermined polymerization degree, and the vinyl chloride system copolymer was compounded.
[0130]
[Formula 3]



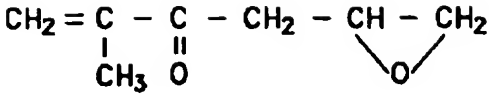
[0131]
[Formula 4]



[0132]
[Formula 5]



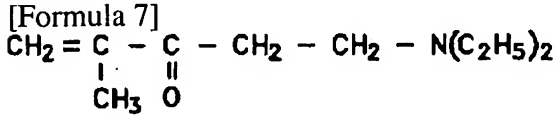
[0133]
[Formula 6]



[0134] In addition, in order to introduce -SO3Na as a polar group, hydroxyethyl sulfonate sodium salt was added to PVC1-PVC6 which are shown in Table 4 at a predetermined rate. Moreover, PVC7 and PVC8 carried out copolymerization of the dimethylaminoethyl methacrylate (it is hereafter called DMMA for short.) shown in the methacrylic-acid diethylaminoethyl (it is hereafter called DEMA for short.) and the following-izing 8 which are shown in the following-ization 7 as a monomer which has a polar group and a reactant double bond with the vinyl chloride system copolymer.

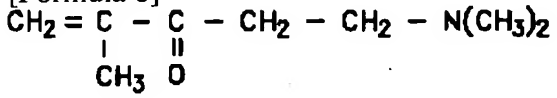
[0135]

[Formula 7]



[0136]

[Formula 8]



[0137] The constituent of the various vinyl chloride system copolymers (PVC 1-8) compounded as mentioned above and polymerization degree are shown in Table 4.

[0138]

[Table 4]

共重合体		PVC1	PVC2	PVC3	PVC4	PVC5	PVC6	PVC7	PVC8
原料（モル比）	塩化ビニルモノマー	86	86	86	86	86	82	85	85
	酢酸ビニル	9	9	9	9	9	-	-	15
	ビニルアルコール	-	-	-	-	-	12	15	-
	グリシジルメタクリレート	5	5	5	5	5	6	-	-
極性基含有化合物 極性基量(mmol/g)		$-SO_3Na$ 0.1	$-SO_3Na$ 0.1	$-SO_3Na$ 0.1	$-SO_3Na$ 0.1	$-SO_3Na$ 0.1	$-SO_3Na$ 0.2	DEMA 0.5	DMMA 0.5
重合度		90	100	300	400	440	250	300	300

[0139] Moreover, below, as the vinyl chloride system copolymer containing an epoxy group was shown below, it was compounded. First, after teaching and deaerating the deionized water 200 section, the sodium-lauryl-sulfate 1 section, the potassium-hydrogencarbonate 1 section, and the potassium persulfate 6 section to the curing units which perform polymerization reaction, the allyl-compound GURISHI diether 30 section and the vinyl chloride 70 section were added, and the polymerization was started as temperature of 60 degrees C. In the place where the internal pressure of curing units descended, unreacted vinyl chlorides were collected, polyaluminium chloride solution was added in polymerization liquid, and polymer particles were solidified and collected. The vinyl chloride copolymer PVC 200 (amount of epoxy content 6.5wt% and -OSO3K polar groups 0.1 mmol/g) whose average degree of polymerization is 200 was obtained by warm water fully washing the collected polymerization object, and drying, after dehydrating. Moreover, it considered as the same composition as this, and reaction conditions, such as an addition of a vinyl chloride, reaction temperature which performs polymerization reaction, and reaction time, were adjusted, and PVC90 whose polymerization degree is 90, PVC100 whose polymerization degree is 100, PVC400 whose polymerization degree is 400, and PVC430 whose polymerization degree is 430 were compounded.

[0140] Next, the sand mill distributed, after kneading each component with ****** and a continuation kneader according to the composition shown below, in order to produce a magnetic paint.

[0141]

[Magnetic paint composition]

Metal magnetism powder (sigmas=150Am2/kg, 56m2/g, Hc=127kA/m) 100 weight section binder:

Polyurethane resin (refer to Table 5 - 13 shown later for an addition)
Vinyl chloride system copolymer (refer to Table 5 - 13 shown later for an addition)
Carbon black (tradename : BP-L, Cabot Corp. make) 2 weight sections alumina (tradename : AKP- 30, Sumitomo Chemical Co., Ltd. make) 6 weight sections butyl stearate 1 weight section methyl ethyl ketone 80 weight sections methyl isobutyl ketone 80 weight sections toluene 80 weight sections [0142] And as a curing agent, the myristic-acid 1 weight section was added as lubricant with the poly isocyanate 4 weight section, and it filtered and prepared using the filter whose average aperture is 1 micrometer. In addition, as shown in Table 5 - 13 showing the various polyurethane resins and the various vinyl chloride system copolymers which were compounded as mentioned above later as a binder, it combined suitably.
[0143] Next, the sand mill distributed, after kneading each component with ****** and a continuation kneader according to the composition shown below, in order to produce a nonmagnetic paint.
[0144]
[Nonmagnetic paint (A) composition]
Nonmagnetic powder: Alpha-Fe 2O3 The 100 weight sections (specific-surface-area =53m2/g, major-axis length = 0.15 micrometers, needlelike ratio = 11)
Binder : [Polyester polyurethane-resin (UR-8200, Toyobo Co., Ltd. make) 4 weight section] A polyvinyl chloride resin (MR-110, Nippon Zeon make) 13 weight sections stearin acid 1 weight section heptyl stearate 1 weight section methyl ethyl ketone 70 weight sections toluene 70 weight sections cyclohexanone 70 weight sections [0145] And the nonmagnetic paint A was adjusted as a curing agent by the poly isocyanate 5 weight section and adding the myristic-acid 1 weight section as lubricant, and filtering and preparing using the filter whose average aperture is 1 micrometer.
[0146] Moreover, the sand mill distributed, after dissolving each component using ****** and DESUPA according to the composition shown below.
[0147]
[Nonmagnetic paint (B) composition]
Nonmagnetic powder : Carbon black (BP-L, Cabot Corp. make) 100 weight sections binder : Polyester polyurethane resin 40 weight sections heptyl stearate 1 weight section methyl ethyl ketone 100 weight sections toluene 100 weight sections cyclohexanone The 100 weight sections [0148] And the nonmagnetic paint B was adjusted as a curing agent by the poly isocyanate 5 weight section and adding the myristic-acid 1 weight section as lubricant, and filtering and preparing using the filter whose average aperture is 1 micrometer.
[0149] In addition, this polyester polyurethane resin is an isophthalic acid / terephthalic acid / NPG/EG, and is Mn=30000. The third class amine of a polar group (DEAPD) = it is 0.2 mmol/g.
[0150] Furthermore, in order to produce a back-coat paint, according to the composition shown below, each component was distributed using ****** and the ball mill (diameter of steel ball 6mmphi).
[0151]
[Back-coat paint composition]
Carbon black (**50, Asahi carbon company make) 100 weight sections polyester polyurethane (NIPPORAN N-2304) 100 weight sections methyl ethyl ketone 500 weight sections toluene The 500 weight sections [0152] And the poly isocyanate 10 weight section was added as a curing agent, and the back-coat paint was adjusted by filtering and preparing using the filter whose average aperture is 1 micrometer.
[0153] On the polyethylene-terephthalate film (a PET film is called hereafter.) which are the <production of monolayer application type magnetic tape> sample 1 - a sample 38 and a sample 40 - the sample 51 thickness of 10 micrometers, each magnetic paint prepared as mentioned above was applied using the die coating machine, and the magnetic layer whose thickness is 3.0 micrometers was formed. Then, after KYUA [having performed calender processing, and / it / having used the obtained magnetic-recording medium original fabric as the temperature of 60 degrees C] for 24 hours, two or more monolayer application type magnetic tapes were produced by carrying out a slit as width of face of 1/2 inch.

[0154] When adjusting a sample 39 magnetism paint, the monolayer application type magnetic tape was produced like the sample 1 except not adding the poly isocyanate as a curing agent.
[0155] The magnetic layer was formed on the non-magnetic layer with the humid multistory application method with which the nonmagnetic paint which used the die coating machine and was prepared as mentioned above on the PET film which are the <production of multistory application type magnetic tape> sample 52 - the sample 83 thickness of 10 micrometers is applied, and a nonmagnetic paint applies a magnetic paint to the inside of a damp or wet condition further. In addition, the application thickness of a non-magnetic layer and a magnetic layer is shown in Table 10 - 13 mentioned later.
[0156] And after carrying out orientation processing by the solenoid coil, one principal plane in which the magnetic layer of a nonmagnetic base material is formed applied the back-coat paint on the other principal planes of an opposite side, and formed the back-coat layer which is the thickness of 0.7 micrometers. Then, after KYUA [having made it dry as temperature of 120 degrees C, having performed calender processing, and / the obtained magnetic-recording medium original fabric / having used temperature as 60 degrees C] for 24 hours, two or more multistory application type magnetic tapes were produced by carrying out a slit as width of face of 1/2 inch.
[0157] In order to evaluate the property shown below to the magnetic tape produced as mentioned above, as various measurement was shown below, it was performed. Moreover, the glass transition temperature of the magnetic layer in each magnetic tape was measured.
[0158] <the glass-transition-temperature measuring method of a magnetic layer> -- after applying on a PET film with a thickness of 10 microns by making a magnetic paint into the thickness of 3 micrometers first, it dried as temperature of 60 degrees C for 20 hours, and the sample tape was produced And the glass transition temperature of a sample tape was measured as 35Hz of test frequencies, 2.0 degrees C of programming rates, and min with the dynamic viscoelasticity measuring instrument (tradename : RHEOVIBRON MODEL RHEO -2000, the product made from ORIENTEC). Furthermore, it asked for the glass transition temperature of the magnetic layer with which a monolayer application type magnetic tape and a multistory application type magnetic tape are equipped by deducting and carrying out the result of the glass transition temperature for a PET film simple substance.
[0159] After applying and drying <dispersibility> magnetism paint liquid on the polyethylene-terephthalate film which is the thickness of 14.0 micrometers, the glossiness (gross) of an application side was measured as a degree of incidence of 45 degrees using the digital deflection glossmeter (tradename : VG- 1D, digital deflection glossmeter VG[made from the Nippon Denshoku industry]-1D). And the glossiness of each magnetic tape was expressed in accordance with the following error criteria.
O : it evaluated by measuring the square shape ratio Rs under the temperature of 20 degrees C, and 50% conditions of RH to <static magnetism property> each magnetic tape using a super-[only for room temperatures] altitude type oscillating sample type magnetometer (tradename : VSM-P10-15auto, Toei Industry, Inc. make) more than more than 180%**:150% and less than 180%x:less than 150%.
[0160] Using <PH endurance> beta cam VTR (tradename : BVW- 75, Sony Corp. make), under the temperature of 20 degrees C, and 50% conditions of RH, record/reproduction was continuously performed to 125 virgin magnetic tapes of merit for 500 hours for 120 minutes, and change of an output was measured. And each PH endurance was expressed in accordance with the following error criteria. Thing O which does not have :output change and does not have powder omission in a head sliding surface O : although there is no output change Thing x with the output change within thing **:2.0dB as which powder omission is regarded by the head sliding surface : A head clog (loading) is raised. The transfer characteristic > digital beta cam VTR (tradename : DVW- 500, Sony Corp. make) is used. thing < which the head it becomes impossible to take an output generated -- electromagnetism -- The output was measured having used the test frequency as 32MHz, and it evaluated by calculating the relative value when setting the reproduction output of a sample 43 to 0dB.
[0161] 200 continuation runs were performed to merit's magnetic tape under the temperature of 20 degrees C, and 50% conditions of RH for 120 minutes using the <performance-traverse> beta cam VTR (tradename : BVW- 75, Sony Corp. make). And each performance traverse was expressed in accordance

with the following error criteria.
O Thing x from which the run became unstable by the thing **:friction rise of which :complete running was done : about the surface roughness of the thing <measurement of surface roughness> magnetic layer which the ball up generated by friction rise, it measured on condition that the following according to the measuring method indicated by JIS-B0601. In addition, the measurement size was measured as 3 and these averages were made into surface roughness.
Measuring instrument ephemeris-time-30HK (made in the Kosaka lab)
measurement conditions tracer method with a contact edge radius of curvature of 2 micrometers measuring-range: -- 250 micrometerx50-micrometer height scale-factor: -- x50000 cut-off: -- the measurement result of the more than related with a 80 monolayer application type magnetic tape (a sample 1 - sample 51) and the combination of the polyurethane resin and copolymer which were used as a binder are doubled, and it is shown in Table 5 - 9
[0162] In addition, it is shown in Table 5 - 9 by making into weakness the case where the case where the case where it considers as pressure 400 kg/cm at the temperature of 120 degrees C is made into the pressure of 200kg/cm at the temperature of 100 degrees C strength as calender conditions at the time of performing calender processing is made into pressure 100 kg/cm at the temperature of 80 degrees C inside.
[0163] Moreover, in samples 47 and 48, average degree of polymerization is 420 and VAGH (made in Union Carbide) used as a copolymer in which the compound which has a vinyl group comes to carry out a polymerization is a vinyl chloride-vinyl acetate-vinyl alcohol copolymer. Moreover, average degree of polymerization is 450 and the copolymer VMCH (made in Union Carbide) used in samples 49 and 50 is a vinyl chloride-vinyl acetate-maleic-acid copolymer.
[0164] It is molecular weight Mn=40000 and Mw=80000, and polyurethane UR-8200 (Toyobo Co., Ltd. make) used in the sample 51 has SO3Na as a polar group, and is a polyurethane resin whose urethane machine concentration is 2.0 mmol/g further again. Moreover, average degree of polymerization is 300 and copolymer MR-110 (Nippon Zeon Co., Ltd. make) used in the sample 51 is vinyl chloride resin which has an epoxy group, a hydroxyl group, and a sulfate machine.
[0165] Moreover, in samples 41 and 42, the nitrocellulose (NC-1 / 2H:Asahi Chemical Industry Co., Ltd. make) was used as a copolymer. In addition, it is considering as * all over Table 9.
[0166]
[Table 5]

		サンプル1	サンプル2	サンプル3	サンプル4	サンプル5	サンプル6	サンプル7	サンプル8	サンプル9	サンプル10
磁性層	ポリウレタン	PU1	PU1	PU1	PU1	PU1	PU1	PU1	PU1	PU2	PU3
	添加量(重量部)	10	10	10	10	10	10	10	10	10	10
	共重合体	PVC1	PVC2	PVC3	PVC4	PVC5	PVC6	PVC7	PVC8	PVC3	PVC3
	添加量(重量部)	10	10	10	10	10	10	10	10	10	10
	Tg(℃)	100	110	110	110	110	110	110	110	110	110
	表面粗度Ra(nm)	5.3	5.6	6.0	6.2	6.5	6.8	5.9	6.1	5.6	5.8
	カレンダー条件	中	中	中	中	中	中	中	中	強	強
特性	光沢度	○	○	○	○	△	○	○	○	○	○
	静磁気特性Rs(%)	86.0	85.0	84.9	83.2	79.8	84.2	84.3	83.3	84.1	83.8
	PH耐久性	△	○	○	○	○	○	○	○	○	○
	出力(dB)	2.0	1.2	1.2	0.8	0.2	0.5	0.9	0.9	1.1	1.1
	走行性	○	○	○	○	○	○	○	○	○	○

[0167]
[Table 6]

		サンプル11	サンプル12	サンプル13	サンプル14	サンプル15	サンプル16	サンプル17	サンプル18	サンプル19	サンプル20
磁性層	ポリウレタン	PU4	PU5	PU6	PU6	PU6	PU7	PU8	PU8	PU8	PU8
	添加量(重量部)	10	10	7	7	10	10	10	10	10	5
	共重合体	PVC3	PVC3	PVC3	PVC3	PVC3	PVC3	PVC3	PVC3	PVC3	PVC3
	添加量(重量部)	10	10	10	10	10	10	10	10	10	10
	Tg(℃)	100	110	100	100	100	130	130	130	130	100
	表面粗度Ra(nm)	4.3	5.2	2.8	3.1	7.0	5.3	9.2	7.2	5.1	6.5
	カレンダー条件	中	中	強	中	弱	強	弱	中	強	弱
特性	光沢度	○	○	○	○	○	○	○	○	○	○
	静磁気特性Rs(%)	84.1	84.4	85.3	85.1	83.2	84.1	83.8	83.5	83.3	84.0
	PH耐久性	○	○	○	○	○	○	○	○	○	○
	出力(dB)	1.3	1.2	2.6	2.1	0.3	0.9	-0.6	-0.3	1.1	1.0
	走行性	○	○	△	○	○	○	○	○	○	○

[0168]
[Table 7]

		サンプル21	サンプル22	サンプル23	サンプル24	サンプル25	サンプル26	サンプル27	サンプル28	サンプル29	サンプル30
磁性層	ポリウレタン	PU9	PU10	PU1	PU2	PU3	PU4	PU11	PU12	PU13	PU8
	添加量(重量部)	10	10	10	10	10	10	10	10	10	5
	共重合体	PVC3	PVC3	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200
	添加量(重量部)	10	10	10	10	10	10	10	10	10	15
	Tg(℃)	140	150	100	110	110	100	110	100	130	100
	表面粗度Ra(nm)	5.5	6.3	5.2	5.6	6.2	4.3	5.2	4.2	5.2	6.7
	カレンダー条件	強	強	中	中	中	中	中	中	強	弱
特性	光沢度	○	△	○	○	○	○	○	○	○	○
	静磁気特性Rs(%)	82.3	80.1	86.2	85.6	84.6	85.3	84.9	85.6	85.5	84.9
	PH耐久性	○	○	◎	◎	○	○	○	◎	○	◎
	出力(dB)	1.0	0	2.3	2.0	1.8	2.5	1.7	2.6	1.8	1.3
	走行性	○	○	○	○	○	○	○	○	○	○

[0169]
[Table 8]

		サンプル31	サンプル32	サンプル33	サンプル34	サンプル35	サンプル36	サンプル37	サンプル38	サンプル39	サンプル40
磁性層	ポリウレタン	PU8	PU8	PU1	PU1	PU1	PU1	PU1	PU9	PU9	PU1
	添加量(重量部)	7	10	10	10	10	10	10	10	10	10
	共重合体	PVC200	PVC200	PVC90	PVC100	PVC400	PVC420	MR-110	PVC200	PVC200	-
	添加量(重量部)	13	10	8	8	8	8	8	10	10	0
	Tg(℃)	110	130	115	115	115	115	115	140	145	120
	表面粗度Ra(nm)	5.8	4.3	4.3	4.4	5.3	6.2	5.3	5.2	5.5	5.6
	カレンダー条件	中	強	中	中	中	中	中	強	強	強
特性	光沢度	○	○	○	○	○	△	○	○	○	△
	静磁気特性Rs(%)	84.4	85.0	86.9	86.1	84.2	82.5	83.6	83.2	84.6	78.5
	PH耐久性	◎	◎	△	○	◎	◎	◎	◎	○	○
	出力(dB)	1.8	2.3	3.0	2.6	1.6	0.9	1.2	1.4	1.6	-1.0
	走行性	○	○	○	○	○	○	○	○	○	○

[0170]
[Table 9]

		サンプル41	サンプル42	サンプル43	サンプル44	サンプル45	サンプル46	サンプル47	サンプル48	サンプル49	サンプル50	サンプル51
磁性層	ポリウレタン	PU11	PU11	PU14	PU15	PU16	PU17	PU14	PU15	PU16	PU17	UR-8200
	添加量(重量部)	8	15	10	10	10	10	10	10	10	10	10
	共重合体	※	※	PVC3	PVC3	PVC3	PVC4	VAGH	VAGH	VMCH	VMCH	MR-110
	添加量(重量部)	10	5	10	10	10	10	10	10	10	10	10
	Tg(℃)	90	120	25	30	40	40	25	30	40	40	30
	表面粗度Ra(nm)	6.2	4.9	4.2	5.3	3.5	6.8	5.1	6.4	5.3	5.8	5.5
	カレンダー条件	強	強	弱	弱	中	弱	弱	弱	中	弱	弱
特性	光沢度	△	○	○	○	○	○	○	○	○	○	○
	静磁気特性Rs(%)	78.6	82.1	82.0	81.5	82.0	82.3	82.0	83.0	81.3	82.1	81.6
	PH耐久性	×	×	×	×	×	×	×	×	×	×	×
	出力(dB)	-0.2	-0.5	0	0	0.3	-0.5	0	-0.2	-0.1	-0.5	-1.0
	走行性	○	○	○	○	○	○	○	○	○	○	○

[0171] As a binder which a magnetic layer contains, a glycol and aromatic system diisocyanate carry out

a polymerization, and the polyurethane whose urethane machine concentration is 3 or more mmol/g, and the copolymer the compound which has a vinyl group comes to carry out a polymerization are contained, and the sample 1 whose glass transition temperature of a magnetic layer is 100 degrees C or more - a sample 39 have good PH endurance so that clearly from Table 5 - 9. therefore, it turns out that the intensity of a magnetic layer is markedly alike, improves, and is equipped with the endurance which bears only an intact magnetic tape continuously at the use under record / special service condition of reproducing Moreover, the output of a sample [a sample 1 -] 39 is improving. therefore, electromagnetism -- it turns out that the transfer characteristic is improving

[0172] on the other hand, the magnetic tape of the sample 40 which a glycol and aromatic system diisocyanate carry out a polymerization, and contains as a binder only PU1 whose urethane machine concentration is 3 or more mmol/g -- the dispersibility of a magnetic layer -- falling -- electromagnetism -- it turns out that the transfer characteristic deteriorates

[0173] Moreover, it turns out that a glycol and aromatic system diisocyanate carry out a polymerization, and the magnetic tape of the samples 41 and 42 containing the binder which combined PU11 whose urethane machine concentration is 3 or more mmol/g, and the nitrocellulose (NC-1/2H) which is the copolymer which does not have a vinyl group does not have desired endurance.

[0174] Furthermore, it turns out that the sample 43 whose glass transition temperature of a magnetic layer is less than 100 degrees C - the sample 51 do not have desired endurance using PU14-PU17 whose urethane machine concentration is less than 3 mmol/g, or UR-8200.

[0175] Here, when the sample 1 was compared with the sample 2, the sample 2 containing PVC2 whose polymerization degree is 100 as a binder was understood although the sample 1 containing PVC1 whose polymerization degree is 90 was excelled in endurance. The sample 4 which, on the other hand, contains PVC4 whose polymerization degree is 400 as a binder if a sample 4 is compared with a sample 5 was understood that the glossiness of a magnetic layer is high and the dispersibility of a magnetic layer is more higher than the sample 5 containing PVC5 whose polymerization degree is 440.

[0176] Moreover, when the sample 33 was compared with the sample 34, it turns out that the sample 34 containing PVC100 whose polymerization degree is 100 as a binder excels the sample 33 containing PVC90 whose polymerization degree is 90 in endurance. The sample 35 which, on the other hand, contains PVC400 whose polymerization degree is 400 as a binder if a sample 35 is compared with a sample 36 was understood that the glossiness of a magnetic layer is high and the dispersibility of a magnetic layer is more higher than the sample 36 containing PVC420 whose polymerization degree is 420.

[0177] therefore -- while a magnetic tape equips the bottom of a special service condition with usable endurance certainly by containing the vinyl chloride system copolymer whose polymerization degree is 100 or more and 400 or less range as a binder -- the dispersibility of a magnetic layer -- more -- improving -- the optimal electromagnetism for high-density record -- it turns out that it has the transfer characteristic certainly

[0178] Moreover, when the sample 13 was compared with the sample 14, the magnetic layer front face was mirror-plane-ized by calender processing, and it turns out that the sample 14 the surface roughness Ra of whose is 3.1nm has stable performance traverse from the sample 13 whose surface roughness Ra is 2.8nm. the sample 18 the surface roughness Ra of whose of the sample 15 whose surface roughness Ra of a magnetic layer is 7.0nm as compared with a sample 15 and a sample 18 is 7.2nm on the other hand -- electromagnetism -- it turns out that the transfer characteristic is good

[0179] therefore, the ranges of a magnetic tape of the surface roughness Ra of a magnetic layer are 3nm or more and 7nm or less -- performance traverse -- being stabilized -- good electromagnetism -- it turns out that it has the transfer characteristic

[0180] Moreover, when the sample 38 was compared with the sample 39, the sample 38 equipped with the magnetic layer which contains the poly isocyanate as a curing agent was understood that PH endurance is more higher than the sample 39 equipped with the magnetic layer which does not contain the poly isocyanate. Therefore, since the adhesive property of this magnetic tape of a magnetic layer and a nonmagnetic base material improved and its solvent resistance of a magnetic layer improved by

containing the poly isocyanate as a curing agent, it turns out that the bottom of a special service condition is certainly equipped with usable endurance.

[0181] Furthermore, the polyurethane resin which has the third class amine as a polar group as a binder (PU1, and PU2, PU8, PU12 grade), The magnetic tape contained combining the vinyl chloride system copolymer (PVC200, PVC400, MR-110 grade) containing an epoxy group, For example, it turns out that a sample 23, a sample 24, a sample 28, a sample 30, a sample 31, a sample 32, a sample 35, a sample 37, and sample 38 grade do not have powder omission in a head sliding surface, and it excels in PH endurance very much.

[0182] therefore, as for the magnetic tape, by containing the binder which comes to combine the polyurethane resin which has the third class amine as a polar group, and the vinyl chloride system copolymer which has an epoxy group as polar groups showed that the intensity of a magnetic layer becomes very high, and endurance was markedly alike and improved

[0183] Next the measurement result of the more than related with a multistory application type magnetic tape (a sample 52 - sample 83) and the combination of the polyurethane resin and copolymer which were used as a binder are doubled, and it is shown in Table 10 - 13. in addition, electromagnetism -- the transfer characteristic was evaluated by calculating the relative value when setting the reproduction output of a sample 77 to 0dB Moreover, average degree of polymerization is 420 and the copolymer VAGH (made in Union Carbide) used in samples 77 and 78 is a vinyl chloride-vinyl acetate-vinyl alcohol copolymer. Moreover, as for the copolymer VMCH used in samples 79 and 80, average degree of polymerization is 450 and (made in Union Carbide) is a vinyl chloride-vinyl acetate-maleic-acid copolymer.

[0184]

[Table 10]

		サンプル52	サンプル53	サンプル54	サンプル55	サンプル56	サンプル57	サンプル58	サンプル59
磁性層	ポリウレタン	PU1	PU2	PU3	PU4	PU11	PU12	PU13	PU8
	添加量(重量部)	10	10	10	10	10	10	10	5
	共重合体	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200
	添加量(重量部)	10	10	10	10	10	10	10	15
	塗布厚み(μm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Tg(℃)	100	110	440	100	110	100	130	100
非磁性層	塗料	A	A	A	A	A	A	A	A
	塗布厚み(μm)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
特性	光沢度	○	○	○	○	○	○	○	○
	静磁気特性Rs(%)	86.2	85.6	84.6	85.3	84.9	85.6	85.5	84.9
	PH耐久性	◎	◎	○	○	○	◎	○	◎
	出力(dB)	3.0	2.9	2.6	3.1	3.2	3.3	2.9	3.1
	走行性	○	○	○	○	○	○	○	○

[0185]

[Table 11]

		サンプル60	サンプル61	サンプル62	サンプル63	サンプル64	サンプル65	サンプル66	サンプル67
磁性層	ポリウレタン	PU8	PU8	PU1	PU1	PU1	PU1	PU1	PU9
	添加量(重量部)	7	10	10	10	10	10	10	10
	共重合体	PVC200	PVC200	PVC90	PVC100	PVC400	PVC420	MR-110	PVC200
	添加量(重量部)	13	10	8	8	8	8	8	10
	塗布厚み(μm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Tg(℃)	110	130	115	115	115	115	115	140
非磁性層	塗料	A	A	A	A	A	A	A	A
	塗布厚み(μm)	2.5	2.5	1.5	1.5	1.5	1.5	1.5	1.5
特性	光沢度	○	○	○	○	○	△	○	○
	静磁気特性Rs(%)	84.4	85.0	86.9	86.1	84.2	82.5	83.6	83.2
	PH耐久性	◎	◎	△	○	◎	◎	◎	◎
	出力(dB)	3.0	2.9	3.3	4.0	3.5	2.3	2.8	3.0
	走行性	○	○	○	○	○	○	○	○

[0186]

[Table 12]

		サンプル68	サンプル69	サンプル70	サンプル71	サンプル72	サンプル73	サンプル74	サンプル75	サンプル76
磁性層	ポリウレタン	PU9	PU9	PU9	PU9	PU18	PU19	PU10	PU20	PU21
	添加量(重量部)	10	10	10	10	8	8	8	8	8
	共重合体	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200	PVC200
	添加量(重量部)	10	10	10	10	10	10	10	10	10
	塗布厚み(μm)	0.2	0.5	0.6	0.8	0.3	0.3	0.3	0.3	0.3
	Tg(℃)	140	140	140	140	90	100	155	160	175
非磁性層	塗料	B	B	B	B	A	A	A	A	A
	塗布厚み(μm)	0.5	0.5	0.5	0.5	1.5	1.5	1.5	1.5	1.5
特性	光沢度	○	○	○	○	○	○	○	○	○
	静磁気特性Rs(%)	83.6	83.2	83.0	82.1	84.6	84.1	83.6	81.0	80.0
	PH耐久性	○	○	○	○	×	○	◎	◎	◎
	出力(dB)	3.5	3.3	2.9	2.5	2.5	2.5	2.3	1.8	1.2
	走行性	○	○	○	○	○	○	○	○	○

[0187]
[Table 13]

		サンプル77	サンプル78	サンプル79	サンプル80	サンプル81	サンプル82	サンプル83
磁性層	ポリウレタン	PU14	PU15	PU16	PU17	UR-8200	PU14	PU1
	添加量(重量部)	10	10	10	10	10	10	10
	共重合体	VAGH	VAGH	VMCH	VMCH	MR-110	MR-110	-
	添加量(重量部)	10	10	10	10	10	10	0
	塗布厚み(μm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Tg(℃)	25	30	40	40	30	30	120
非磁性層	塗料	A	A	A	A	A	A	A
	塗布厚み(μm)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
特性	光沢度	○	○	○	○	○	○	△
	静磁気特性Rs(%)	82.0	83.0	81.3	82.1	81.6	81.3	78.5
	PH耐久性	×	×	×	×	×	×	○
	出力(dB)	0	-0.2	-0.1	-0.5	-1.0	0.5	-1.0
	走行性	○	○	○	○	○	○	○

[0188] Although a sample 52 - a sample 71 and a sample 73 - a sample 76 are magnetic tapes equipped with a non-magnetic layer between a magnetic layer and a nonmagnetic base material so that clearly from Table 10 - 13 The polyurethane resin whose urethane machine concentration a glycol and aromatic system diisocyanate carry out a polymerization, and is 3 or more mmol/g as a binder which a magnetic layer contains, Contain the copolymer the compound which has a vinyl group comes to carry out a polymerization, and since the glass transition temperature of a magnetic layer is 100 degrees C or more while the intensity of a magnetic layer is equipped with the endurance which is markedly alike, improves and bears only an intact magnetic tape continuously at the use under record / special service condition of reproducing -- electromagnetism -- it turns out that it excels in the transfer characteristic
[0189] On the other hand, it turns out that the sample 77 whose glass transition temperature of a magnetic layer is less than 100 degrees C - the sample 82 do not have desired endurance using PU14-PU17 whose urethane machine concentration is less than 3 mmol/g, or UR-8200. since [moreover,], as for the magnetic tape of the sample 83 which a glycol and aromatic system diisocyanate carry out a polymerization, and contains as a binder only the polyurethane resin whose urethane machine concentration is 3 or more mmol/g, the viscosity of a magnetic paint increases -- the dispersibility of a magnetic layer -- falling -- electromagnetism -- it turns out that the transfer characteristic deteriorates
[0190] Moreover, as for the sample 72 equipped with the magnetic layer containing PU18 whose glass transition temperature is less than 100 degrees C, it turns out that the glass transition temperature of a magnetic layer becomes less than 100 degrees C, and does not have desired endurance. Therefore, the glass transition temperature of the polyurethane resin contained as a binder in a magnetic layer was understood that it is desirable that it is 100 degrees C or more.
[0191] Here, when the sample 62 was compared with the sample 63, it turns out that endurance of the sample 63 containing PVC100 whose polymerization degree is 100 as a binder improves rather than the sample 62 containing PVC90 whose polymerization degree is 90. The sample 64 which, on the other hand, contains PVC400 whose polymerization degree is 400 as a binder if a sample 64 is compared with a sample 65 was understood that the glossiness of a magnetic layer is high and the dispersibility of a magnetic layer is more higher than the sample 65 containing PVC420 whose polymerization degree is

420.
[0192] therefore -- while a magnetic layer equips the bottom of a special service condition with usable endurance certainly as a binder also in a multistory application type magnetic tape by containing the vinyl chloride system copolymer whose polymerization degree is 100 or more and 400 or less range -- dispersibility -- excelling -- the optimal electromagnetism for high-density record -- it turns out that it has the transfer characteristic certainly
[0193] furthermore, so that application thickness of a magnetic layer is made thinner than a sample 68 - a sample 71 -- electromagnetism -- it turns out that the transfer characteristic improves Therefore, the application thickness of a magnetic layer was understood that it is desirable that it is 0.5 micrometers or less.
[0194]
[Effect of the Invention] The magnetic-recording medium concerning this invention so that clearly also from the above explanation The polyurethane resin whose urethane machine concentration a glycol and aromatic system diisocyanate carry out a polymerization, and is 3 or more mmol/g as a binder, Have a magnetic layer containing the copolymer the compound which has a vinyl group comes to carry out a polymerization, and since the glass transition temperature of a magnetic layer is 100 degrees C or more the bottom of a service condition high [the dispersibility of a magnetic layer], and special -- also setting -- usable endurance -- having -- the optimal electromagnetism for high-density record and digital storage -- it has the transfer characteristic

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[Translation done.]